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TITLE: International Meeting on Medical Simulation

PRINCIPAL INVESTIGATOR: Elizabeth H. Sinz

CONTRACTING ORGANIZATION: Society for Medical Simulation
Santa Fe, NM 87501-1850

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Society for Medical Simulation

www.socmedsim.org

6th annual International Meeting on Medical Simulation

The World of Simulation

San Diego™

January 14-17, 2006

Sheraton Hotel & Marina

San Diego, CA

6th Annual International Meeting on Medical Simulation

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7th Annual IMMS

January 14, 2007

Pre-conference meetings & special activities

January 15-17, 2007

Conference Sessions & Workshops

Orlando Florida

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2006 Officers and Committee Chairs will be announced at the Annual Meeting Sunday at the awards luncheon.

Welcome to the International Meeting on Medical Simulation

Dan Raemer, Ph.D.
President, Society for Medical Simulation

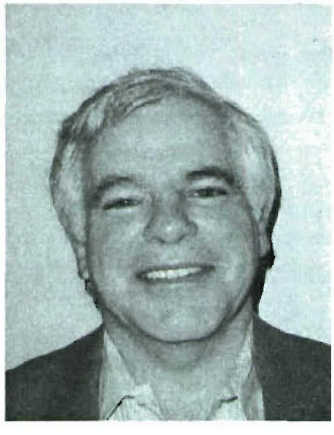
Dear Attendees,

How exciting is it to be at the dawning of an emerging field? So many new colleagues, nascent ideas, groundbreaking technologies appear before us at a rate that exceeds our ability to fully embrace them. Our enthusiasm is fueling a revolution in healthcare education and patient safety advancement. What better way to latch on to that whirlwind than to spend a few exciting days in nearly perfect weather here in San Diego at the International Meeting on Medical Simulation?

The meeting committee headed by Richard Riley from Perth and flanked by Michael DeVita from Pittsburgh and Marcus Rall from Tuebingen and Barry Issenberg from Miami, have put together a truly unique program of panels, workshops, poster presentations and roundtables that represent an extraordinary array of topics, information, and ideas. The breadth of disciplines represented, facets of the simulation world displayed, and geographical diversity they have brought together is a reflection of the growth of simulation and its leap from a novelty a few short years ago into the mainstream today.

A number of noteworthy accomplishments deserve our reflection as we embark on this meeting experience. First, this is the first of the five IMMS annual events that is run entirely by the Society for Medical Simulation. I am proud to say that SMS, albeit only two years since its inception, has grown at a rate that we can barely accommodate. It is apparent to me that the growth of SMS is fueled by its decidedly multi-disciplinary vision and the dedication of its members and Board of Directors. The outlook for SMS and this meeting is unbounded. Second, this IMMS marks the inaugural publication of a new journal, *Simulation in Healthcare*, devoted solely to advancing our field. With the appointment of David Gaba as Editor-in-Chief, a stellar Editorial Board, and the commitment of Lippincott, Williams and Wilkins as publisher we can look forward to the arrival on our doorsteps and websites a steady stream of sharply focused articles of the highest quality. Finally, notice the support and collaboration of many familiar as well as new organizations and industrial partners who have committed to the success of this meeting and the Society. Their participation will underpin our efforts long into the future.

I urge you to participate fully in the extraordinary opportunities this meeting has to offer. I know you will be inspired.



Sincerely,

Dan

Mark your calendar and spread the word....

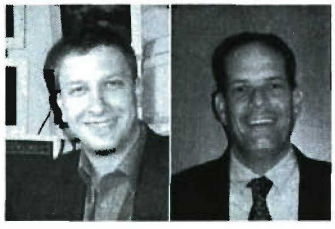
7th Annual IMMS
January 14, 2007
Preconference meetings

January 15-17, 2007
Conference Sessions
Orlando Florida

Welcome from the Program Committee Chairs

It gives me great pleasure to welcome you to San Diego to the 6th International Meeting on Medical Simulation (IMMS). This is the first standalone meeting of the Society of Medical Simulation and I hope that you take this opportunity to meet and interact with your colleagues. I thank you for contribution to this meeting and look forward to your continuing support of SMS and the World of Simulation. I also have to thank my committee for all of their hard work to put together a program of such high quality. **Richard Riley, Course Director**

The workshops this year have been submitted by you, and they were chosen by a peer-reviewed competitive process to provide the broadest and deepest experience possible. It is doubtful that anyone here cannot find a workshop that fits your educational need. Please look carefully, and attend. Give us feedback regarding which are the best (and why) which are the least useful and what we left out. Please think of how your workshop next year will add to the program, and submit! **Michael DeVita, Workshop Chair**



Colleagues, researchers, educators, and wizards of simulation; please take your time and study the abstracts submitted to this year's meeting. Abstracts are the earliest fruits of research and development, some of which are never published and so every year gems of wisdom, knowledge and experience are lost. Abstract sessions should be the hottest part of any scientific meeting and I invite you to actively participate: science means learning and critiquing.
Marcus Rall (L) and Barry Issenberg (R) Abstract Co-Chairs

Keynote Faculty

Roger Kneebone PhD FRCS FRCSEd MRCGP ILTM
Senior Lecturer in Surgical Education, Department of Surgical Oncology and Technology, Imperial College London.. Dr. Kneebone trained first as a surgeon, working both in the UK and in Southern Africa. After finishing his specialist training, Roger decided to become a family physician. In the 1990s he developed an innovative national training programme for minor surgery within primary care, using simulated tissue models and a computer-based learning program. In 2003, Roger left his practice to join Imperial College London. The Department of Surgical Oncology and Technology is a leading international centre for surgical simulation and assessment, with an extensive range of virtual reality simulators as well as a full-scale simulated operating theatre. The Department's multiprofessional academic team provides expertise in surgery, computing, education and clinical safety. Roger's current research focuses on the contextualisation of clinical learning. Working with colleagues from communication and computing, he has developed innovative approaches to learning invasive clinical procedures, where models are attached to simulated patients to create a safe yet realistic learning environment. Roger also leads several high-profile national programmes aimed at training healthcare professionals to undertake new roles within the UK National Health Service.

Usha Satish, PhD
Associate Professor of Psychiatry' SUNY Upstate Medical University, Syracuse NY and Visiting Associate Professor, Stanford University School of Medicine, Stanford, CA. Dr. Usha Satish, received training in clinical psychology, behavioral medicine, and neuro psychology and man machine simulations. She currently holds professorial positions in the Department of Psychiatry at SUNY Upstate medical university and the Department of Surgery at Stanford University. She directs the simulation laboratory at SUNY upstate medical university which focuses extensively on developing simulation based learning tools for medical residents with a special emphasis on decision making skills. The assessment technology used helps make training more focused and cost effective. Her innovative work on applying simulation technology in medicine to train physicians and diagnose deficits in cognitive functioning, and rehabilitate patients has earned her rewards and worldwide recognition of colleagues. She has authored several articles in the area of assessment and training. In addition to her efforts to apply complexity theory to the clinical arena, she is involved in a number of research projects that evaluate the impact of prescription drug treatment on patient quality of life and efforts to explore the use of simulation technology toward a diagnosis and treatment of a range of CNC dysfunctions.

6th Annual
International Meeting on Medical Simulation
January 14-17, 2006
Sheraton San Diego Hotel & Marina

2006 IMMS Committee
Course Director: Richard Riley, FANZCA
Workshop Chair: Michael DeVita, MD
Abstract Chair: Dr. med Marcus Rall
Immediate Past Chairs: Elizabeth Sinz, MD, William Dunn, M.D, Stefan Moenk, MD
Committee Members: Sheena Ferguson, MSN, RN CCRN, Mark Bowyer, MD, Bernadette Henrichs, PhD, CRNA, S. Barry Issenberg, MD, John Schaefer, III MD

Course Overview and Objectives
This is a 2.5 day conference which features plenary and keynote sessions, workshops, roundtable discussions, and research abstracts. Exhibits of technology, software and support services will also be available for viewing. Participants will be able to further their understanding of the use of simulation for education and assessment of health care professionals, discuss development of simulation training scenarios, be introduced to new technologies in the field of simulation, and review the current research in medical simulation. Roundtable discussions address specific disciplines and areas of interest to the simulation community.

Who Should Attend
This conference is designed for the physician, nurse, educator, technician, engineer and simulation center personnel involved in the academic, community and program and service development arena of simulation. This is an international conference with all sessions in English.

Notes on Special Events/Activities
Continental Breakfasts/Breaks:
Continental breakfasts will be served in the exhibit area from 6:45 – 8:15 am only on Sunday & Monday and in the HI foyer on Tuesday. Coffee/tea break service will be available ONLY during scheduled breaks in the exhibit area. At other times, please feel free to visit one of the restaurants or beverage service areas in the hotel.

Sunday

- SMS Annual Meeting: Grand Ballroom. Attendee Badge required
- Welcome Reception – 6:30-7:30 pm in the Exhibit Area. Dress: Casual. Cash Bar and hors d'oeuvres.

Monday

- Box Lunch – pick up in the Exhibit Area. Attendee Badge required. Take outside – or to a meeting – and network with other attendees.
- World of Simulation: - 7-9 pm in the Lanai Area outside. Wear your home country/state attire. An International array of food stations; cash bar. Attendee badge and ticket required.

Check the bulletin board by conference registration for other activities & updates.

Continuing Education Credits
This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of the University of Pittsburgh School of Medicine and the Society for Medical Simulation. The University of Pittsburgh School of Medicine is accredited by the ACCME to provide continuing medical education for physicians.

The University of Pittsburgh School of Medicine designates this educational activity for a maximum of **19** category 1 credits toward the AMA Physician's Recognition Award. Each physician should claim only those credits that he/she actually spent in the educational activity.

Nursing Education Credits
25.2 Contact hours of continuing nursing education are provided by the University of Pittsburgh School of Nursing (provider number 009-3-E-04). The University of Pittsburgh School of Nursing is an approved provider of continuing nursing education by the Pennsylvania State Nursing Association, an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation.

Physicians and those requesting CME credits

- Complete the CME form with required information and return to the conference registration desk. This document goes to UPITT, the accreditation sponsor. The certificate of attendance provides directions for obtaining a credit transcript directly from UPITT.
- Complete and return the evaluation form to the conference registration desk.

Nursing CE

- Sign in and out DAILY in the sign-in book. This is sent to UPITT to document attendance and CE hours awarded.
- Complete the nursing evaluation form and return to the conference registration desk. In return, receive your CE certificate of attendance.

Certificates of attendance only

- Certificates of attendance – *which do not award CE or CME credits* - are available at the conference registration desk.

These requirements are mandated by UPITT for CME and CE accreditation.

Society for Medical Simulation
PMB 300 223 N. Guadalupe
Santa Fe NM 87501
505-983-4923 FAX 505-983-5109
IMMS@SocMedSim.org

Program in Brief

Sunday 1/15

7:00–8:00 am	Naut	Continental Breakfast with exhibitors
8:00-9:45	HI 1&2	GSI. Keynote Address
10:15-11:30	HI 1	GSII. Medical Education
10:15–11:30	HI 2	GSIII. Nursing & Allied Health Education
10:15–11:30	SeaB	GSIV. Simulation in Military & Hazardous Environments
12:00– :15 pm	GB	SMS Annual Meeting and Luncheon
1:30–3:00	HI 1	GSV. Serious Games/3-Dimensional Interactive Environments
1:30–3:00	HI 2	GSVI Virtual patients
3:15–5:30	See schedule	Workshops
3:15–4:15	HI 1	Roundtable I Simulation Center Readiness
3:15–4:15	Mar	Roundtable II Medical Specialties
5:00–7:00	HI 1	Roundtable III Starting a Simulation Center: A Tale of Two Centers
6:30-7:30	Exh	Welcome Reception

Monday 1/16

7:00-8:00 am	Naut	Continental Breakfast with exhibitors
8:00–9:00	HI 1&2	GSVII. Keynote Address
9:30–1130	HI 1	Oral Abstract Presentations & Posterside Professor Rounds
10:00-11:30	SeaB	Roundtable IV –Pro-Con Debate
10:00-11:30	Spin	Roundtable V - Pediatrics
10:00–12:00	HI 2	Roundtable VI - TATRC
11:30–1:00	Naut	Box lunches available
1:00–2:30 pm	HI 1	GSVIII Engineering Issues in Simulation
1:00– :30	HI 2	GSIX Training Devices & Screen Based Simulation
1:00–2:30	SeaB	GSX. Surgery & Surgical Specialties
2:45–5:30	See schedule	Workshops
3:00-4:30	HI 1	AIMS Working Group
3:00–4:00	Marina	Roundtable VII Emergency Medicine
5:00–6:30	HI 1	Roundtable VIII - Simulation Center Operations
7:00–9:00	Lanai	The World of Simulation – International Party

Tuesday 1/17

7:00-8:00 am	Foyer	Continental Breakfast
8:00–10:00	HI 1	GSXI. Simulation Research
8:00–10:00	HI 2	GSXII. National Simulation Initiatives
10:30–12:00	HI 1&2	XIII Finale – Lessons Learned
12:00 noon		Adjourn

Additional meetings of note

1/14	2:00-4:00 pm	Exec Suite	SMS Board of Directors (closed)
	5::30	Exec Suite	Journal Editorial Board (closed)
1/15	6:00-7:00 pm	Mar 1	CME Discussion Group
1/16	9:30 am	Mar 1	Games Special Interest Group
	11:30	HI 2	Academic Emergency Medicine Sim.Task Force (closed)
	12 noon	Spin	Meet the Journal Editors
	11:00	Mar 1	ASA Working Group (Closed)
	3:00-4:30	HI 1	AIMS Working Group

Meeting Room Key

HI - Harbor Island SeaB - Sea Breeze Naut - Nautilus (lower level)
Mar – Marina GB – Grand Ballroom Spin - Spinnaker

Official Exhibit Hours:

1/15 – 7-8 am, 9:45-10:15 am, 3:00-4:15 pm and 6:30-7:30 pm Welcome Reception
1/16 - 7-8 am, 9:00am-1:00 pm 2:45-3:45 pm
Exhibitors may elect to be in their exhibits for longer hours but are not required to do so.

Interested in submitting a manuscript to the

Simulation in Healthcare: The Journal of the Society for Medical Simulation?

If you……
Have questions about what type of article?
Have questions about submission requirements?
Never published before?
Want some helpful feedback on your ideas?

Then…..

Grab your box lunch on Monday and

Meet the Editors

12:00 noon
Monday, January 16

Spinnaker Room

Program Detail

Sunday 1/15

7:00–8:00 am	Naut	Continental Breakfast with exhibitors
8:00-9:45	HI 1&2	**GSI. Keynote Address** Moderator: Richard Riley Simulation in Context – Looking Towards the Future Roger Kneebone
9:45-10:15	Naut	**Break**
10:15-11:30	HI 1	**GSII. Medical Education** Moderator: Lindsey Henson Acquisition of Expertise: Simulation & Deliberate Practice K. Anders Ericsson Improving Teaching: Why you can Never Get it Just Right Kelley Skeff Program Evaluation: Assessing the Impact Eva Baker
10:15–11:30	HI 2	**GSIII. Nursing & Allied Health Education** Moderator: Sheena Ferguson *Annual Clinical Competencies For Clinical Staff Using Benner's Framework: It's Not Just For Critical Care!* Lorena Beeman *Meaningful Advanced Life Support Learning: How To Make It Real For EMS And ED Personnel* Larry Cobb *Development of a Mechanical Ventilation Learning Program: Different Strokes for Different Folks* Joseph Morelos
10:15–11:30	SeaB	**GSIV. Simulation in Military & Hazardous Environments** Moderator: Mark Bowyer *Challenges For Training Healthcare Providers For Military & Hazardous Environments* Mark Bowyer *Training Military First Responders* Joseph Miller *Israeli Experience To Train Healthcare Providers For Biological & Chemical Attacks* Amitai Ziv
12:00–1:15 pm	GB	**SMS Annual Meeting and Luncheon**
1:30–3:00	HI 1	**GSV. Serious Games/3-Dimensional Interactive Environments** Moderator: Jeff Taekman *Serious Games In Healthcare* Jeff Taekman *Case Studies, Impediments & Solutions* Noah Falstein *Military Gaming: Debriefing, After Action Review & Capabilities* Jerry Heneghan
1:30–3:00	HI 2	**GSVI Virtual patients** Moderators: Robby Reynolds, Martin Nachbar *What Are VP's; And Their Advantage* *Rationale For Cross-Institutional Sharing & Collaboration* *Leverage Experience, Resources And Research* *Fostering An Immersive Simulation Environment* Grace Huang, Parvati Dev, J.B. McGee, Carol Kamin, Thomas Agresta

3:30-4:30	Naut	**Break**
3:15–4:15 & 4:30-5:30	See schedule	Workshops
3:15–4:15	HI 1	**Roundtable I Simulation Center Readiness** Moderator: Michael Seropian
3:15–4:15	Marina	**Roundtable II Medical Specialties** Moderator: Christopher Cates Panel: Michael Cowley, John Ochs, Anthony Gallagher, Kenneth Cavanaugh
5:00–7:00	HI 1	**Roundtable III Starting a Simulation Center: A Tale of Two Centers** Moderators: William Dunn, Amitai Ziv
6:30-7:30	Naut	**Welcome Reception**

Monday 1/16

7:00-8:00 am	Naut	Continental Breakfast with exhibitors
8:00–9:00	HI 1&2	**GSVII. Keynote Address** Moderator: Daniel Raemer *Competency in Decision Making: Evaluation via Cognitive Simulations* Usha Satish
9:00– 0:00	Naut	**Break**
9:30–1130	HI 1	**Oral Abstract Presentations & Posterside Professor Rounds** Moderator: Marcus Rall & Barry Issenberg
10:00-11:30	SeaB	**Roundtable IV – Pro-Con Debate** Moderators: William Dunn, Lisa Sinz *High Fidelity Simulation Should be Used for Examination – Pro/Con*
10:00-11:30	Spin	**Roundtable V – Pediatrics** Moderator: Peter Weinstock
10:00–12:00	HI 2	**Roundtable VI – TATRC** Moderator: Gerry Moses
11:30–1:00	Naut	Box lunches available in Exhibit area
1:00–2:30 pm	HI 1	**GSVIII Engineering Issues in Simulation** Moderator: Michel Audette *Challenges in Visually & Haptically Realistic Simulation of Soft Tissue Behaviour* Frank Tendick *A new Paradigm of Internet-Based Surgical Simulation* Kevin Montgomery
1:00–2:30	HI 2	**GSIX Training Devices & Screen Based Simulation** Moderator: Harry Owen *Simulation-Based Medical Training/What Works, What Doesn't And What We Need* Harry Owen *Selection Of Simulation Equipment/Technology To Meet Curricular Needs* Debra Spunt
1:00–2:30	SeaB	**GSX. Surgery & Surgical Specialties** Moderator: Mark Bowyer *Surgical Simulation: Past, Present And Future* Mark Bowyer *Educational Issues & Practical Implications Of Simulation In Surgical Training* Roger Kneebone *Simulation For Training In Laparoscopic Surgery* Randy Haluck

2:30-4:45	Naut	**Break**
2:45–3:30 & 3:45-4:30 & 4:45–5:30	See schedule	Workshops
3:00–4:00	Marina	**Roundtable VII Emergency Medicine** Moderator: Mary Patterson Panel: Robert Wears
5:00–6:30	HI 1	**Roundtable VIII - Simulation Center Operations** Moderators: Yue-Ming Huang, *Operational Infrastructure Of Simulation Centers; Curriculum / Academic Issues* Thomas Dongilli, Peter Dieckmann, Guillaume Alinier
7:00–9:00	Lanai	**The World of Simulation –International Party-** *Badge or Guest Tickets required*

Tuesday 1/17

7:00-8:00 am	Foyer	Continental Breakfast
8:00–10:00	HI 1	**GSXI. Simulation Research** Moderator: William McGaghie, Barry Issenberg *Development of simulators & simulation systems* Gerry Moses *Using simulations to evaluate human performance* Steven Howard *Using simulation technology for training & assessment* Haim Berkenstadt
8:00–10:00	HI 2	**GSXII. National Simulation Initiatives** Moderator: Richard Riley *EMAC: The Australia & New Zealand Experience* Jennifer Weller *Germany: Federal Simulation Program* Stefan Moenk *Israeli Training program* Amitai Ziv
10:00-10:30	Foyer	**Break**
10:30–12:00	HI 1&2	**XIII Finale – Lessons Learned** Moderator: Dale Alverson Dan Raemer, David Gaba, Roger Kneebone, Usha Satish & selected faculty
12:00 noon		Adjourn

7th Annual IMMS

January 14, 2007

Pre-conference meetings & special activities

January 15-17, 2007

Conference Sessions & Workshops

Orlando Florida

GENERAL SESSION AND ROUNDTABLE FACULTY

Listing as of 12/5/2005. Additions or corrections will be announced from the podium

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FACULTY DISCLOSURE

Faculty for this activity have been required to disclose all relationships with any proprietary entity producing health care goods or services, with the exemption of non-profit or government organizations and non-health care related companies. Faculty disclosures for workshop faculty are indicated on the workshop description pages.

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Berkenstadt	Ericsson	Huang, G	Morelos	Raemer	Tendick
Bowyer	Cavanaugh	Huang, YM	Moses	Reynolds	Weller
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Moenk	Consult METI
Dieckmann	Consult: SimuLearn; Speak:Laerdal
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Falstein	Health Media Lab for Hungry Red Planet/title only
Haluck	Verefi Technologies
Ochs	Cordis Corporation
Kneebone	Medical Skills Ltd.
Issenberg	University of Miami

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University of Miami Center for Research in Medical Education

Kneebone Keynote Address & Resident Abstract Award

Telemedicine & Advanced Technology Research Center (TATRC/MRMC)

General meeting and faculty support contract

We would also like to thank Laerdal and METI for sharing their exhibit rooms and equipment for workshops.

Use of space and/or equipment in no way implies endorsement by SMS.

Learning objectives for General Sessions and Roundtables

Refer to these learning objectives when evaluating conference speakers. Workshop descriptions include individual workshop learning objectives.

GSI. Keynote Address	*To be aware of the future applications of simulation*
GSII. Medical Education	*Understand how one acquires expertise using simulation;* *Recognize methods of improving teaching* *Identify means to use evaluation effectively*
GSIII. Nursing & Allied Health Education	*To describe the numerous uses of Benner's framework for other than CC* *Identify ways to change ALS for providers* *Define a method of developing simulation programs for providers*
GSIV. Simulation in Military & Hazardous Environments	*Understand simulation uses in military, biological and chemical environments*
GSV. Serious Games/3-Dimensional Interactive Environments	*Recognize how serious games can be used for learning scenarios*
GSVI Virtual patients	*Communicate the benefits of simulation to the administration of an institution to benefit research and group dynamics*
Workshops - see individual workshops for learning objectives	
Roundtable I Simulation Center Readiness	*Appraise the current status of your simulation center to meet the real needs.*
Roundtable II Radiology	*Discuss the use of simulation for radiology*
Roundtable III Starting a Simulation Center: A Tale of Two Centers	*Summarize the steps taken by two institutions to start a simulation center*
GSVII. Keynote Address	*Demonstrate the use of evaluation in determining competency*
Oral Abstract Presentations & Posterside Professor Rounds	*Summarize the research being done in field of medical simulation*
Roundtable IV – Anesthesiology	*Recognize the pros and cons of using high fidelity simulation for examination*
Roundtable V - Pediatrics	*Discuss the uses of simulation in field of pediatric medicine*
Roundtable VI - TATRC	*Appreciate the role of TATRC in promoting simulation research*
GSVIII Engineering Issues in Simulation	*Comprehend the technologies – new and old – and equipment needs for simulation center educational programs.*
GSIX Training Devices & Screen Based Simulation	*Appreciate the difficulty of realistic simulation in certain scenarios.* *Aware of how surgeons are using computer-based simulation*
GSX. Surgery & Surgical Specialties	*Appreciate the development of simulation in surgical field for education, training, and specific disciplines*
Workshops - see workshop descriptions for learning objectives	
Roundtable VII Emergency Medicine	*Acquainted with the various methods of simulation for training of emergency medicine personnel*
Roundtable VIII - Simulation Center Operations	*Recognize the diversity of operational infrastructures of simulation centers*
GSXI. Simulation Research	*Understand how simulation equipment is developed* *Relate methodologies of evaluating simulation scenarios* *Assess the technologies available*
GSXII. National Simulation Initiatives	*Summarize the operations of international simulation centers*
XIII Finale – Lessons Learned	*Express the major points discussed in conference and participate in future planning.*

2006 Exhibitors

Please take time to visit all the exhibitors. Their participation in this meeting helps insure a successful event for the Society and meets our goal of introducing attendees to products, services and organizations involved in medical simulation. Please be sure to see the educational booths* in the poster area as well. Descriptions of exhibitors' products and services are provided in a separate document to comply with ACCME guidelines.

Booth #	Company Name
21*	Association of Standardized Patient Educators
2	B Line Express
9	Center for Medical Simulation
8	Clarus Medical
15	Education Management Solutions
4 & 5	Gaumard Scientific
3	Immersion
16	IngMar Medical Ltd.
11	KB Port
Nautilus 5	Laerdal
20	Limbs & Things
19	Lippincott Williams & Wilkins
22*	Mayo Multidisciplinary Simulation Center
12	Mentice Inc.
Nautilus 4	METI
1	SilverTree Media
7	Simbionix
6	Simulab
18	Simulaids
10	Studiocode Business Group
23*	Uniformed Services University
13 & 14	University of Miami
17	Verifi Technologies Inc.

7th Annual IMMS

January 14, 2007

Pre-conference meetings & special activities

January 15-17, 2007

Conference Sessions & Workshops

Orlando Florida

- On-line submission for workshops and abstracts opens June 1.
- Workshop submission deadline: October 1
- Abstract submission deadline: October 15

Michael DeVita, MD
2007 Conference Chair

Mark your calendars now.
Special rates for Walt Disney World theme parks will be available.

GS I
Sunday Keynote

Simulation in context – looking towards the future

Roger Kneebone
Senior Lecturer in Surgical Education, Department of Biosurgery & Technology, Imperial College London, UK

Learning objectives

By the end of this session, participants will have:

1. An understanding of key elements of simulator development and relevant educational theory
2. An awareness of patient-focused learning and the contextualization of procedural skills
3. An understanding of key challenges for future development of simulation with healthcare education

Presentation outline

This presentation will start by summarizing key developments in simulator technology, especially relating to surgery.
A brief summary of relevant educational theory will locate the presentation within the literature from a range of related fields.
Using original work from his research group at Imperial College London, the presenter will develop and elaborate the concept of patient-focused simulation.
The presentation will emphasize the crucial importance of clinical context in the learning and assessment of procedural skills.
The presentation will conclude with speculation about the future direction of simulation within healthcare education.

Moderator: Lindsay Henson, MD
University of Louisville

Acquisition of Expertise: Simulation and Deliberate Practice

K. Anders Ericsson, Ph.D.
Department of Psychology
Florida State University Tallahassee, FL

Learning objectives:

1. Identify and name the three phases of skill acquisition according the traditional theories by Fitts and Posner.
2. Describe empirical evidence questioning the effects of further experience on improvements of automated performance.
3. Four characteristics of deliberate practice activities and how the engagement in them leads to changes in the structure of the acquired mechanisms mediating performance.
4. Four paths by which simulation can facilitate and support deliberate practice activities.

Summary

Recent research in many domains of expertise, such as chess, medicine, music and sports, confirms that some forms of nurture, such as mere experience with domain-relevant activities, have surprisingly limited benefits for enhancing performance, once an acceptable level has been attained. For example, some of us know recreational golfers who haven't improved after decades of active playing. However, the research on expert performance also demonstrates that focused appropriate training activities--*deliberate practice*--can dramatically change the human body and brain, and over extended time modify virtually all characteristics relevant to superior performance, *with the exception of height*.

The acquisition of expert performance through deliberate practice involves successive development of increasingly refined mental representations and mechanisms that give experts increased control over their performance and allow them to circumvent the limits that acquired everyday skills, such as typing and driving a car, impose on beginners' performance. Consequently, the development of expert performance will be primarily limited by the availability of appropriate training environments, such as simulations, and individuals' ability to sustain concentration during effortful deliberate practice.

References

Ericsson, K. A. (2004). Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains. *Academic Medicine, 10, S1-S12.*

Ericsson, K. A. (2005). Recent advances in expertise research: A commentary on the contributions to the special issue. *Applied Cognitive Psychology, 19*, 233-241.

For more information see Anders Ericsson's webpage:
http//www.psy.fsu.edu/faculty/**ericsson**.dp.html

Improving Teaching: Why You Can Never Get it Just Right

Kelley M. Skeff, M.D., Ph.D. , Stanford University Department of Medicine
Co-Director, Stanford Faculty Development Center

- Learning Objective

Participants will:

- become familiarized with a 7 category framework that can be used to analyze and improve clinical teaching
- be able to apply this framework to the understanding of the success and challenges of simulation-based teaching

- Presentation summary/outline

I. Challenges of clinical teaching
II. The utility of the 7-category Framework
III. Opportunities for Simulation-based learning in Medicine
IV. Faculty Development Invitation

- websites

Stanford Faculty Development Center Website
http://sfdc.stanford.edu

Program Evaluation: Assessing the Impact

Eva L. Baker
Distinguished Professor
Director, Center for Research on Evaluation, Standards, and Student Testing (CRESST)
University of California, Los Angeles (UCLA)

Learning Objectives: The learners will be able to

1) Differentiate among the purposes of evaluation and designs related to purpose.
2) Describe the cognitive models that should guide the creation of measures of simulated learning.
3) Describe the types of technical quality information needed to assure desired outcomes.
4) Identify issues in measurement and evaluation that require adaptation for simulated environments.

Description of Presentation

The presentation, guided by PowerPoint slides, will review evaluation purposes and research designs appropriate for drawing inferences. Evaluation plans usually involve a wide range of data to be collected about various outcomes. The general flaw in such designs is inadequate attention to the design and quality of the measures used to draw inferences about status or impact. The presentation will address how high-quality measures should be designed and how they may be targeted to the simulation or to the transfer and generalization of skills and expertise. To create (or evaluate) the quality of measures, a set of principles will be presented, each of which is relevant to a particular

aspect of validity (or quality). Finally, the presentation will close with considerations of the characteristics of simulation development and use that interact with measures and evaluation practices. Throughout the presentation, economic issues will be addressed. Participants will be given a scenario (for in class or to take home, if time doesn't permit) that allows them to work through an example of the precepts presented.

References

American Educational Research Association, American Psychological Association, and National Council on Measurement in Education. (1999). *Standards for educational and psychological testing.* Washington, DC: American Educational Research Association.

Baker, E. L., Chung, G. K. W. K., Delacruz, G. C., & Bewley, W. (2005, July). *Design, learning, and metrics for problem solving in simulations*. Presentation at the Office of Naval Research Conference on Metrics for Evaluating Performance in Simulations, Redondo Beach, CA.

Baker, E. L., & Herman, J. L. (2003). A distributed evaluation model. In G. Haertel & B. Means (Eds.), *Evaluating educational technology: Effective research designs for improving learning* (pp. 95-119). New York: Teachers College Press.

http://www.cresst.org

http://www.adlnet.org/downloads/124.cfm

GS III
Nursing & Allied Health Education

Multidisciplinary Clinical Education for Nursing & Allied Health: Working Teams are the Only Way to Go!

Sheena Ferguson, MSN, RN, CCRN, CNS-Pulmonary (Chair)
Lorena Beeman, MS, RN, CCVT, Critical Care Educator
Larry Cobb, BSN, RN, EMT-P, Advanced Life Support Director
Joseph Morelos, BS, RRT, RCP, Ventilator Specialist
Clinical Education, Community Training Center, Human Simulation Lab
AKA The BATCAVE University of New Mexico Hospitals, UNM Health Sciences Center

In this one hour session, the faculty will present a cross-section of our curricula focusing on three concepts within our education framework:

Overall Learning Objective:

Sheena Ferguson: Introduction 3-5 minutes

I. Present the BATCAVE framework for our Multidisciplinary Curricula: Process, implementation, evaluation and outcomes with High-Fidelity Human Simulation

Instructor Specific Objectives:

Lorena Beeman: 15 minutes

II. Annual clinical competencies for Clinical Staff using Benner's Framework: It's not just for critical care!

- Simulation technology is an evolving modality that can be used to evaluate critical thinking and competency
- Challenges to the educator include assessment of the learner's competence and selection of the appropriate level of simulation technology
- This section will provide a framework by which these challenges can be met in congruence with Benner's model of novice to expert.

Larry Cobb: 15 minutes

III. Meaningful Advanced Life Support Learning: How to make it real for EMS and ED personnel

- The absence of a tool hinders the participants ability to independently demonstrate their knowledge base
- Using simple tools and inexpensive reproductions enhances the ability to evaluate performance and removes the talking about it, removes the "I would have..."
- The techniques in this section describe how to permits reproducible, real-life, high quality ALS.

Joseph Morelos: 15 minutes

IV. Development of a Mechanical Ventilation Learning Program: Different Strokes for Different Folks

- Mechanical ventilation is a widely used modality that requires knowledge beyond simply settings to adequately ventilate the patient with optimum results
- We present our education program for improving the understanding and use of mechanical ventilation in a teaching facility within FCCS, RALeS and Graphics
- Specific detail of the Meti manikin settings and the ventilator are discussed.

Question & Answer Period: 10 minutes

Panel Title: Simulation in Military and Hazardous Environments

Training health care providers to provide high quality care in austere environments (such as combat) or in the face of biological or chemical attacks is difficult. Simulation is ideally situated to this task as exposure to real-life events is fortunately limited. This panel will discuss the challenges and successes of this unique educational task.

Panel Chair: Colonel Mark W. Bowyer, MD
Chief, Division of Trauma and Combat Surgery
Surgical Director of Simulation
National Capital Area Medical Simulation Center
Uniformed Services University
Bethesda, Maryland
301-295-8155
mbowyer@usuhs.mil

Panel Members: Amitai Ziv, MD, MHA
Deputy Director, Chaim Sheba Medical Center
Director, Israel Center for Medical Simulation
Tel-Hashomer, Israel
972-52-6666071
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Lt. Col. Joseph P. Miller, MD
Director, Anderson Simulation Center
Madigan Army Medical Center
Tacoma, Washington
253-596-7955; 253-968-2808
joseph.perretty.miller@us.army.mil

Learning Objectives:

After attendance at this panel audience members will:

1. Have an increased understanding of the nature of military austere environments and the challenges to providing civilian quality health care that exist.
2. Have an increased understanding of the difficulties of providing quality health care in an environment where there is the presence or threat of chemical or biological contamination.
3. Have an increased understanding of the current role of simulation for training military medics and other health care providers to deliver quality care in combat.
4. Have an increased understanding of the current use of simulation in Israel for training health care providers to provide care during chemical or biologic attack.

Panel Presentation Schedule:

Col Bowyer (15 min)

Introduction and Overview of the challenges of training health care providers for military and hazardous environments.

Learning Objectives:

- Introduce the concepts of military unique and chemical/biological environments and the challenges inherent to training healthcare providers to work in these environments.
- Discuss the current and future role of simulation in training those who will care for those in harms way.

Dr. Miller (15 min)

Training military first responders (Medics) using simulation

Learning Objectives:

- Outline the challenges associated with training Military Medics to function effectively in a combat environment.
- Discuss the current and future role of simulation in training military medics.

Dr. Ziv (15 min)

The Israeli experience with using simulation to train health care providers for Chemical and Biological attacks.

Learning Objectives:

- Introduce challenges inherent to training healthcare providers to work in hazardous environments.
- Discuss the current and future role of simulation in training providers to provide quality care in the face of chemical or biological attacks.

Question & Answer Panel discussion (15 min)

Serious Games/3-Dimensional Interactive Environments

Moderator: Jeff Taekman

Serious Games In Healthcare Jeff Taekman

Case Studies, Impediments & Solutions Noah Falstein

Military Gaming: Debriefing, After Action Review & Capabilities Jerry Heneghan

GS VI

Virtual Patients

This AAMC Sponsored Virtual Patient (VP) Panel Session consists of 5 short (10 minutes) presentations from various experts in the field. At the conclusion of the presentations the floor will be opened for audience participation (comments, discussion and questions).

Moderators:

Martin Nachbar, MD
New York University School of Medicine

Robby Reynolds, MPA
Association of American Medical Colleges

Title: Virtual Patients: The Case Method Brought to Life

Panelist:

Grace Huang, MD
Carl J. Shapiro Institute for Education and Research at Harvard Medical School and Beth Israel Deaconess Medical Center
Harvard Medical School

Learning Objectives:

1. Describe deficiencies in the current model for clinical training for medical students and residents
2. Depict the spectrum of what can be called virtual patients
3. Describe the unique advantages of virtual patient simulation

Outline:

1. Definition of VP's
2. Clinical Training Deficiencies
3. Advantages to VP's in terms of content
4. Advantages to VP's in terms of pedagogy
5. Advantages to VP's in terms of patient safety
6. Challenges for VP's
7. Future horizon for VP's in education and assessment

References:

1. http://www.aamc.org/meded/mededportal/vp/

Title: Virtual Patients and Educational Theory

Panelist:

Carol S. Kamin, MS, EdD
University of Colorado Health Sciences Center School of Medicine

Learning Objectives:

1. Use learning goals to decide which type of simulation is most appropriate.
2. Discuss teaching strategies for incorporating case simulations.

Outline:

1. Diverse educational theories and their role in designing simulations
2. Lessons learned about case effectiveness from PBL research
3. Relevant research from other e-learning methods
4. How change theory informs what we know about dissemination and adoption

References:

1. http://mama.uchsc.edu/pub/live/intro_pub.htm
2. Kamin, C.S., O'Sullivan, P., Deterding, R. & Younger, M. (February 2003). A comparison of critical thinking in groups of third-year medical students in text, video, and virtual PBL case modalities. *Academic Medicine 78(2):204-211.*

Title: Use of a Mock Electronic Medical Record as a Curriculum Delivery Tool

Panelist:

Thomas P. Agresta, MD
University of Connecticut School of Medicine

Learning Objectives:

1. Understand the use of a Mock Electronic Medical Record as a delivery tool for simulated curriculum
2. Be able to discuss use of simulated standardized families for longitudinal curriculum delivery and evaluation

Outline:

1. Presentation of the Mock Electronic Medical Record for Education (mEMR_e©)
    a. Rationale for development
    b. Unique features for simulated, longitudinal family case delivery
2. Overview of the use of mEMR_e within the Family Medicine rotation
3. Discussion of strategies for longitudinal simulation activities within a curriculum

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Title: Simulations For Individual And Team Use

Panelist:

Parvati Dev, PhD
Stanford University School of Medicine

Learning Objectives:

1. Learn that there are a range of simulations available
2. Understand the implications for pedagogy of the different simulations
3. Learn about multiplayer games as a new tool for patient simulation

Summary:

We will examine a range of patient simulations from simple multimedia patient records to patients who respond through speech and video. We will touch on novel sensory modalities such as haptics and stereo in creating a sense of "presence". Finally we will discuss the potential of modeling teams of people interacting with a simulated patient, and the use of gaming technology to implement these virtual worlds.

References:

1. http://summit.stanford.edu/
2. http://simtech.stanford.edu/
3. http://simworkshops.stanford.edu/

Title: The Virtual and the Reality

Panelist: J.B. McGee, MD

University of Pittsburgh School of Medicine

Learning Objectives:

1. List the primary challenges in creating and maintaining virtual patients
2. Define strategies to enlist faculty and staff in the virtual patient production process
3. Describe methods to make developing and sharing virtual patients easier
4. Outline national and global efforts to collaborate in the production and dissemination of virtual patients

Summary:

This presentation will highlight the challenges and successful solutions associated with 10 years of producing virtual patients and cases. Sustainable and scaleable approaches to virtual patient utilization will be presented along with analysis of the relative educational value of high-fidelity and low-fidelity approaches. There will be a discussion of national and international collaborative efforts to define technical standards for virtual patient sharing using XML and open source technologies.

References:

1. http//labedutech.medschool.pitt.edu
2. http://girounds.pitt.edu
3. http://navigator.medschool.pitt.edu/agacases

GS VII
Monday Keynote

Competency in Decision Making: Evaluation via Cognitive Simulations

Usha Satish
Associate Professor, Dept. of Psychiatry, SUNY Upstate Medical University, Syracuse, NY
Visiting Associate Professor, Dept. of Surgery, Stanford School of Medicine, Palo Alto, CA

Learning Objective:

- Measurement of competency from the perspective of complexity theory
- Understanding underlying components of decision making
- Use of simulation technology in improving cognitive elements of critical thinking
- Strategies of decision making in competency and leadership

Presentation Summary: The multidimensional aspects of medical decision making poses educators with a challenging task in terms of assessment and training. Challenges of this nature, and measurement of competencies under conditions of ambiguity and uncertainty, are addressed by complexity theory. Early versions of complexity theory originated in the behavioral and management sciences; parallel later versions encompass all fields of science, including physics, chemistry, economics, medicine and more. Behavioral complexity theory describes characteristic competencies that are needed to deal effectively with complex challenges. The theory has generated the basis for multiple competency assessment technologies that capture those competencies in a reliable and meaningful (valid) fashion. Theory based assessments allow the holistic, simultaneous interactions among competency components to be assessed, free of evaluator bias, and in a manner which is generic in its applicability to various professions. More importantly, these assessments set the stage for subsequent feedback and learning. Once the rules of this learning internalized by the individual it sets the stage for a career long optimal learning process.

Complexity theory views decision making as the combination of various skills as they interact with the pieces of information which a person has, and how that person uses those skills and available information in relationship to each other. Complexity theory based assessment allows both evaluation of individual generic competencies and evaluation of how these competencies interact in solving a problem.
A complexity theory based cognitive simulation technology (SMS) has been developed, tuned, and validated over more than a quarter century. This simulation technique immerses the subject in a real world scenario for a period of time and objectively assesses performance.The SMS technique captures a range of skills and focuses on multiple capabilities that allow flexible and appropriate behaviors, including the development of novel approaches to the solution of difficult challenges. Several writers have described simulation techniques in general, and the SMS simulation in particular, as the optimal means to effectively train thinking strategies that are needed today. The SMS simulations have been as useful as other technologies where competence in routine skills is measured, but they have been even more and uniquely effective for assessment and training whenever professional task requirements are multi-faceted and complex.

References:

Satish U, Streufert S and Barach P. Assessing and improving medical competency: Using strategic management simulations. *Simulation and Gaming*, 156-164, 2001

Satish U, Streufert S, Marshall R, Smith S, Powers S, Gorman P and Krummel T. Strategic management simulations is a novel way to measure resident competencies. *The American Journal of Surgery* , 181(6): 557-561, 2001

Satish U, Streufert S. The value of cognitive simulation in medicine: Toward optimizing performance of healthcare personnel. *Quality and Safety in Healthcare, British Medical Journal.* 11(2):163-167, 2002

Engineering Simulation

Chair:

Michel Audette, Ph.D., Innovation Center for Computer Assisted Surgery (ICCAS), Leipzig, Germany, Michel.Audette@medizin.uni-leipzig.de , (formerly of National Inst. Advanced Science & Technology, AIST, Tsukuba, Japan).

Faculty:

Frank Tendick, Ph.D., UCSF Surgical Skills Center, San Francisco.
frankt@itsa.ucsf.edu
Kevin Montgomery, Ph.D., National Biocomputation Center, Stanford, Ca.
kevin@biocomp.stanford.edu

Learning Objectives

1. To inform non-technical participants of technical issues involved in virtual reality-based surgical simulation.
2. To apprize technical participants of current active research issues, and open problems that need to be addressed, in VR-based surgical simulation.
3. To provide tangible examples, to all participants, of research in VR-based simulation currently taking place.

Presentation Summary

1. Michel Audette
VR-based Surgical Simulation: the 2-minute Primer.

A brief presentation on basic concepts in VR-based simulation.

2. Frank Tendick
Challenges in Visually and Haptically Realistic Simulation of Soft Tissue Behavior

The power of computer graphics hardware and software, even on inexpensive personal computers, has enabled surgical simulators that are visually compelling and realistic. Current implementations of haptic interaction through force feedback typically lag behind, however. Although many procedures can be learned adequately with minimal haptic feedback, in general touch is critical to the surgeon's sense of tissue quality and the successful performance of many skills. Haptic perception is probably also tightly connected to the mind's representation of anatomical space.

Fundamentally, for both visual and haptic rendering to be accurate the distortion of tissue shape (through strain) and the resulting forces (stress) must be accurate. This requires accurate models of tissue behavior. Nonlinear finite element modeling is accurate and can be implemented with models of moderate complexity (thousands of elements) at visually smooth rates (greater than 20 frames per second). Although stable haptic interaction requires much higher rates (500 updates per second or more), this is feasible because often only a fraction of the model needs to be calculated at this rate. This talk will

discuss some of the fundamental issues in extending the capability of finite element techniques and implementing them in practical simulators. Basic concepts will be emphasized so that clinicians and others not familiar with technical aspects of simulation can understand the possibilities and challenges ahead.

M.C. Cavusoglu and F. Tendick, "Multirate Simulation for High Fidelity Haptic Interaction with Deformable Objects in Virtual Environments," IEEE Intl. Conf. Robotics and Automation, pp. 2458-64, 2000.

X. Wu, M.S. Downes, T. Goktekin, and F. Tendick, "Adaptive Nonlinear Finite Elements for Deformable Body Simulation Using Dynamic Progressive Meshes." In A. Chalmers and T.-M. Rhyne, eds., Proc. Eurographics 2001. Appearing in *Computer Graphics Forum* vol. 20, no. 3, 2001.

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3. Kevin Montgomery
A New Paradigm of Internet-Based Surgical Simulation

Computer-based surgical simulation systems have produced tremendous benefits and demonstrated validity as a better method for many areas of surgical skills acquisition. However, despite these benefits, broad proliferation of these systems has continued to be elusive. While in large part this lag in adoption of this technology is due to social factors (organizational momentum, curriculum integration difficulties, etc), the cost of computer-based simulation systems has certainly remained a major deterrent toward broad deployment. Instead, what if it were possible to eliminate the cost of the large computer completely from the system, yet provide a much more extensive and detailed simulation than currently available? Further, what if a simulation with even greater detail over a wider anatomical area were possible?

This is the genesis of Project Hydra- a shared simulation supercomputer were made available for free and all that is required to access it is a low-end Internet-connected computer and, optionally, interaction/haptics devices as needed for the particular task. This would enable supercomputer-class simulation at every desktop with much greater fidelity than any user could individually afford and provide an online community for simulation research and application. Further, Internet-based simulation provides for many other benefits as well. By the user merely plugging optional, additional hardware into their existing, low-end PC and using the Internet as a means of simulation dissemination, distribution, and delivery means that the user can have immediate access to simulation updates/upgrades and download/access new content (didactic curriculum and cases). Further, this ease of access and use could lead to accelerated adoption and use of simulation within the medical curriculum and this access is provided anywhere in the world 24x7. In addition, once connected, a server-based simulation system would be a natural point for performing easy, automated clinical studies of surgical performance and skills.

Websites:
Michel Audette: http://www.iccas.de/ , http://staff.aist.go.jp/m.audette/
Frank Tendick: http://itsa.ucsf.edu/~frankt/
Kevin Montgomery: http://biocomp.stanford.edu/kevin/

GS IX

Simulation-Based Medical Training/What Works, What Doesn't And What We Need

Presenter: Harry Owen MD FRCA FANZCA
Director Clinical Skills and Simulation Unit
Flinders University and Flinders Medical Centre
Adelaide, South Australia

Learning objective: By the end of this session participants will be able to undertake a task analysis relevant to the training need and use this to choose an appropriate simulator/simulation technology

Presentation summary/outline:
Task analysis (TA) is a/the most important step in instructional design:

TA provides a blueprint for the instructional design process
TA makes desired outcomes explicit for trainee and trainer (and employer)
TA is essential but often overlooked

Different contexts demand different task analysis methods, such as:

- Activity analysis
- Cognitive task analysis
- Learning analysis
- Job/Procedural analysis
- Subject matter/Content analysis

A typical sequence of TA includes:

- Classifying tasks as learning outcomes
- Inventory of tasks
- Selecting tasks (and prioritising)
- Decomposing tasks/Describing content
- Sequencing tasks and task components
  - Pre-requisite sequencing
- Classifying leaning outcomes
  - Congruity between task and instructional methods
  - Congruity between task and assessment

An example of a TA that can be used in developing teaching of a clinical is Procedural Analysis:

- Procedural analysis assumes that task performance can be analysed as a sequence of overt steps or as a series of observable behaviours
- Widely used with high credibility
- Can be used with other task analysis methods, e.g. path analysis
- Can also be used as a diagnostic tool

Participants will work through examples of TA applied to clinical skills teaching.

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Integrating Training Devices & Screening-Based Simulation in Health Professional Education

Debra L. Spunt MS, RN, FAAN
Assistant Professor and Director
Clinical Simulation
University of Maryland School of Nursing

Learning Objective

1. Identify documents, which have supported the use of simulation for the education and evaluation of students and healthcare practitioners.
2. Discuss how to select the appropriate simulator for assessment vs. learning vs. evaluation.
3. Discuss how to enhance the simulator to maximize the fidelity (realism) of the simulation

Presentation summary/outline:

This presentation will focus the selection of simulators based on individualized program plan and goals of the simulation experience within the curriculum and/or program. The selection of the appropriate simulator for assessment vs. learning vs. evaluation will be explored related to patient safety, evidence based practice ... The fidelity (realism) and ability to replicate the simulation are keep components to a successful simulation for the student and the faculty. How to accomplish these components will be discussed.

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Vandrey, C. & Whitman, M. (2001). Simulator Training for Novice Critical Care Nurses, *AJN,* 101(9), 24GG-24LL.

Panel Title: The Expanding Role of Simulation in Surgical Education

The use of simulation in surgical training has lagged behind other medical disciplines. This has in large part been a result of the limitations in technology and the ability to realistically simulate surgical procedures. As simulator technology has improved, there has been a marked expansion of the use of simulation for training surgeons. This panel will provide an update of the current state of surgical simulation and speculation as to the future role of simulation in the training, certification, and re-certification of surgeons.

Panel Chair: Colonel Mark W. Bowyer, MD
Chief, Division of Trauma and Combat Surgery
Surgical Director of Simulation
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Panel Members:

Roger Kneebone PhD FRCS FRCSEd MRCGP ILTM
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Randy S. Haluck, MD
Director, Minimally Invasive Surgery
Director of Simulation Development
Department of Surgery
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Hershey, Pennsylvania
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Learning Objectives:

After attendance at this panel audience members will:

1. Have an increased understanding of the need for simulation in surgical training and education.
2. Have an increased understanding of the challenges of developing surgical simulators that provide realistic tissue tool interaction.
3. Have an increased understanding of the pressure to introduce simulation into surgical training to reduce error and improve patient safety.

4. Have an increased understanding of the current state of the art of surgical simulation and the potential future developments.

Panel Presentation Schedule:

Col Bowyer (15 min)

Surgical Simulation Past, Present and Future.

Learning Objectives:

- Introduce needs, challenges, current successes, and future potential of simulation for surgical education.

Dr. Kneebone (15 min)

Simulation in surgical training: educational issues and practical Implications.

Learning Objectives:

- Outline the challenges associated with using simulation for surgical training.
- Discuss the current and future role of simulation in training surgeons.

Dr. Haluck (15 min)

Simulation for Training in Laparoscopic Surgery.

Learning Objectives:

- Introduce the current state of the art of simulators for teaching laparoscopic surgery
- Discuss the current and future role of simulation in training surgeons to do minimally invasive surgery
-

For several reasons, the field of computer-based surgical simulation is most mature for minimally-invasive surgical (MIS) techniques to include laparoscopic surgery. MIS in general introduces many new skill requirements which are well-suited to learning in a simulated environment. Accomplishments in the field to date as well as a look to the future will be discussed.

Gallagher AG, Ritter EM, Champion H, Higgins G, Fried MP, Moses G, Smith CD, Satava RM. Related Articles, Links
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Abstract Virtual reality training improves operating room performance: results of a randomized, double-blinded study.
Ann Surg. 2002 Oct;236(4):458-63

Question & Answer Panel discussion (15 min)

The Scope and Promise of Research in Medical Simulation

Faculty

William C. McGaghie, Ph.D., Office of Medical Education and Faculty Development, Northwestern University Feinberg School of Medicine, USA; S. Barry Issenberg, M.D., Center for Research in Medical Education, University of Miami Miller School of Medicine, USA

Learning Objectives

This presentation will address three objectives: (a) present a conceptual framework to organize research in medical simulation, (b) identify broad-based areas for research in medical simulation, and (c) describe current approaches to promote scholarship and advance simulation-based research

Presentation Summary

This presentation will set the table for the three symposium presentations that follow. We begin by presenting a conceptual framework, grounded in G.L. Engel's biopsychosocial model of medical care and education,[1,2] to organize research in medical simulation. The conceptual framework shows that medical simulation intends to model and realistically present nano, histo, organ system, person, social, and cultural phenomena to allow for training and evaluation of health professionals. The framework acknowledges that medical simulation research also ranges from basic design and engineering of products and devices[3] to laboratory and field applications in a variety of educational settings.[4] High-quality scholarship involving medical simulation should also use a phased model that moves from basic laboratory research to community-based field studies, analogous to cancer control investigations.[5] In all cases, medical simulation research must rest on high methodological standards, whether quantitative[6] or qualitative.[7] The presentation will conclude with a description of highly productive research teams and the conditions that contribute to research team success.[8]

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Using Simulations to Evaluate Human Performance

Steven K. Howard, M.D.
Staff Physician
VA Palo Alto Health Care System
Associate Professor of Anesthesia
Stanford University School of Medicine

Learning Objectives:

1) To discuss the use of simulation and simulators to evaluate human performance by providing illustrative examples
2) To discuss the strengths and weaknesses of the use of simulation and simulators to evaluate human performance

Brief Summary:
The technique of simulation has been used for many years outside of healthcare and now is gaining rapidly in popularity in many medical areas. Studying the performance of practitioners in a realistic simulation environment offers many advantages that would be difficult or impossible in real life situations, especially when you impose various stressors.
We have studied the effects of fatigue on the performance of health care personnel in two medical domains – emergency medicine and anesthesiology – and the presenter will use these studies as examples of how simulations can be used to study human performance.

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National Simulation Initiatives

Moderator: Richard Riley
Australia & New Zealand: EMAC Jennifer Weller
Germany: Federal Simulation Program Stephan Moenk
Israeli Training program Amitai Ziv

EMAC: The Australian and New Zealand experience

Presenter

Associate Professor Jennifer Weller, Director, Faculty Education Unit, Specialist Anaesthetist, University of Auckland, New Zealand

Learning Objectives

At the end of this presentation, the audience will have:

- an understanding of a successful international initiative which delivers a unified curriculum in crisis management across the three countries.
- an appreciation of the strategies used to maintain course quality and consistency.

Presentation summary/outline

Background

The ability to effectively manage a medical emergency is a core requirement for an anaesthetist. Until recently however, no formal training has been provided.

The Effective Management of Anaesthetic Crises (EMAC) course aimed to address this gap through a structured, 2.5 day simulation-based course which brings a significant new approach to medical training. EMAC focuses on the role of the anaesthetist as leader, and the impact of the team on patient safety. The general philosophy of the course is to approach problems systematically. Participants acquire the necessary core knowledge and emergency technical skills, learn to use protocols and pre-rehearsed drills during emergencies, develop behavioural strategies to facilitate problem solving, and learn how to manage a team more effectively.

The course consists of five modules: Human Factors, Airway emergencies, Anaesthetic Emergencies, Cardiovascular Emergencies and Trauma. Course content is restricted to events where immediate action is required. The teaching methods have been chosen to engage participants, promote learning by doing, and learn new material in a clinical context in which it would be subsequently applied. Course material is based on evidence based guidelines when available. Participants receive a course manual prior to attendance at the course, which contains factual material to underpin the simulations and workshops.

Governance structure

The EMAC course was developed by a collaboration between simulation centres and the Australian and New Zealand College of Anaesthetists (ANZCA). It was established in 2002 as a component of training for the ANZCA Fellowship and is accredited for Maintenance of Professional Standards for specialist anaesthetists. ANZCA provides governance for the course, and has developed written standards for the course, the facility, the simulators, the staffing ratios and the qualifications of instructors. An ANZCA subcommittee is responsible for ongoing quality assurance of the course, accreditation of new centres, and course revision.

Aim

An evaluation process was undertaken the aim of which was to determine the effectiveness of the EMAC course, and to inform course revision and future course development.

Methods

The evaluation process had three components seeking course uptake, participant feedback during the course, and feedback from participants some months following attendance at the course.

All centres accredited by ANZCA to run EMAC in 2005 were asked to provide the total number of courses they had run, the number of participants on the courses and their status (trainee, specialist or other).

For every EMAC course run in every centre from the inception of the course, participants have completed a standardised anonymous evaluation at the end of each of the five modules and an overall course evaluation at the end of the course. These course evaluations were collated into a single database.

In 2005, a postal survey was sent to all anaesthetists who attended an EMAC course in 2004, seeking their reflections on the course, the impact it had on their practice, and their suggestions for improvements or additions (single mail out only).

Results

There were three simulation centres accredited to run EMAC in 2002. This has risen to seven in 2005, with five centres in Australia, one in New Zealand and one in Hong Kong. Initial analysis indicates there have been over 55 courses run from 2002 to 2005 and over 600 EMAC course participants, with approximately equal numbers of specialist and trainees. Data was collated from over 300 end-of-course evaluations, and showed participants were highly satisfied with the course structure, organisation, standard of instruction and facilities. Each module was considered very useful. Individual module evaluations indicated the course was effective. Participants reported they learnt a great deal, the material was relevant, and they were likely to change their practice. There was an overall increase in self-assessed competency in the course material. Written comments supported these findings, with participants identifying many specific areas of practice they had learnt about and changes they intended to make.

A total of 99 anaesthetists responded to the postal survey (response rate 50%). The results were consistent with the end-of-course questionnaire results, with respondents confirming the relevance of the course, and identifying key things they had learnt and applied to their anaesthetic practice. Eighty-nine percent were of the opinion that the course should be a compulsory component of training for the Fellowship of the Australian and New Zealand College of Anaesthetists.

Discussion

The EMAC course is a standardized, College-accredited course that has become an integral component of training and continuing medical education across three countries. Results of the evaluations show widespread participation and acceptance of the course. It is valued highly and perceived as relevant. EMAC increases anaesthetists' confidence in management of emergencies and leads to changes in workplace practice.

The formal College governance maintains the high standard and uniformity of the course across three nations, and facilitates a co-ordinated approach to revision, updating course material and new course development.

Simulation-based training is now a common experience for many anaesthetists across Australia and New Zealand. Exposure to the concepts of performance shaping factors, systems errors, the components of effective teamwork, a systematic approach to emergencies, and the necessary core knowledge and technical skills is now widespread in the anaesthetic community and should contribute significantly to improving patient safety.

Israel: The National Training program

Amitai Ziv, MD, MHA
Deputy Director, Sheba Medical Center, Israel
Director, Israel Center for Medical Simulation (MSR)
Sheba Medical Center, Tel Hashomer, Israel

- **Learning Objectives:**

At the end of this session, participants will understand:

1. The rationale and structure of a national multimodality simulation-based training program for interns as a mandatory preparedness course
2. The barriers and challenges of implementing and conducting national courses at a national simulation center
3. The lessons learned from three years experience in national simulation-based training initiatives

- **Presentation Summary:**

MSR, the Israel Center for Medical Simulation was established in late 2001 as a virtual hospital encompassing the whole spectrum of medical simulation modalities. A central component in the center's founding vision was to become a national resource, serving the needs of all sectors of healthcare providers, emphasizing the message of patient safety through proactive and structured exposure of trainees to extreme and challenging clinical and communication skill scenarios.

In collaboration with the four Israeli Medical Schools, the Israeli Ministry of Health, and the major general hospitals, MSR designed and initiated a mandatory, five day, intensive simulation-based training program for medical school graduates prior to starting their internship. Driven from a job-analysis of interns' practice and focusing on safety "nightmares" and crucial competencies, a national committee designed a program that includes 9 modules of hands-on training in domains such as BLS, ACLS, PALS, Patient Transport, Basic suturing skills, Basic Ventilation skills and advanced patient/physician communication and risk management skills.

The course is supported by an e-learning interactive website on which interns register, read and fulfill pre-test requirements for the course. This enables each intern to gain the utmost from the hands-on simulation training.

Over 150 healthcare professionals, from all over the country, have been trained to serve as instructors for the course, and 863 interns have participated in 17 courses conducted to date with extremely positive and enthusiastic feedback from participants, instructors and all bodies involved.

The presentation will review the course and its educational, implementation and maintenance challenges and will focus on its national role in changing patient safety culture of young physicians in Israel

- **References, selected readings, websites of note etc:**

A Ziv, D Erez, Y Munz, A Vardi, D Barsuk, I Levine, S Benita, O Rubin, H Berkenstadt. The Israel Center for Medical Simulation: A Paradigm for Cultural Change in Medical Education.
Accepted for publication in Academic Medicine, 2005

http://www.msr.org.il

RT I

Simulation – Are we really ready?

Michael Seropian MD, Associate Professor Oregon Health and Science University Schools of Medicine and Nursing

At the end of the session the following goals and objectives will hopefully be achieved:

1. The participant will be able to communicate a better understanding of simulation readiness and its components
2. The participant will show a basic understand that simulation is not just a manikin or course but a business
3. The participant should be able to articulate a basic strategy to developing a simulation program
4. The participant should be able to discuss why there is disparity in readiness.

Presentation outline:

This session will be an interactive roundtable discussion on readiness for simulation. The core to the discussion will be centered on the elements the group feels are essential to starting and maintaining a simulation program. The discussion should touch on business planning, infrastructure, visioning, collabo0ration, funding to mention a few. Individuals with existing centers or those planning a center are all welcome. The discussion will be complimented by snapshots of data collected from 23 independent sites looking to start simulation. The result may surprise people. This session is as much a think tank session as it is instructive.

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Roundtable II Medical Specialties

Moderator: Christopher Cates
Panel: Michael Cowley, John Ochs, Anthony Gallagher, Kenneth Cavanaugh

Approval of Virtual Reality Training for Carotid Stenting

What This Means for Procedural-Based Medicine

Anthony G. Gallagher, PhD
Christopher U. Cates, MD

PERCUTANEOUS ENDOVASCULAR PROCEDURES CONFER benefits to patients similar to those seen with minimally invasive surgery, such as minimal invasion of the body cavity, reduced pain, shortened recovery time, and more rapid return to work. However, minimally invasive surgery and endovascular procedures also share similar problems.[1] As with minimally invasive surgery, endovascular procedures require physicians to perform invasive procedures guided by 2-dimensional video images while using and manipulating tools with limited degrees of freedom. Endovascular procedures also require the operator to adapt to significantly decreased tactile sensation and overcome similar proprioceptive-visual conflict issues from manipulating long wires or instruments that can fulcrum against the body wall. These hurdles combine to create substantial challenges for physicians training to acquire these skills.

The challenge of training physicians for performance of endovascular procedures has been brought to the forefront because of the rapidly expanding application of carotid stenting for treatment of carotid artery stenosis into the broader medical marketplace. Currently, few physicians are experienced in the carotid stenting technique. However, with the recent US Food and Drug Administration (FDA) approval of carotid stents, many physicians from multiple specialties will want to learn the carotid stenting technique. Traditional training methods for new procedures include performing the procedure on animals, cadavers, or mechanical models or supervised performance of the procedure on patients. Inherent problems with these traditional training strategies include the ethical and anatomical problems of training on animals, risks posed with repeated exposure to radiation, and the expense of consuming real medical devices. However, the majority of procedural training in the United States still occurs on patients with direct mentoring by experienced physicians during an actual clinical procedure.

This tradition of training on patients has raised concern among the profession and the public about how physicians will acquire sufficient skill to safely perform new, potentially high-risk, endovascular procedures such as carotid stenting.[2,3] Because the carotid arteries are the primary blood vessels to the brain, if an embolus of thrombotic plaque dislodges and enters the brain during a carotid stent procedure, the patient could have a stroke or die on the operating table. As with other procedures, carotid stenting has a definite learning curve.[4] However, unlike many other procedures, the risk conferred to the patient in this procedure from the physicians' learning curve is unacceptably high. Traditionally, it was assumed that if a physician performed a procedure a certain number of times or trained for a period of time then that physician became proficient in the procedure. However, essentially no mechanism for measuring posttraining skill has been used.

Both number of procedures and duration of training are, at best, crude surrogate measures of skill and fail to factor in the variability in individual rates of learning. This approach to training produces physicians with considerably variable skills that have been only subjectively assessed by those who trained them.[5] This variation is particularly important with carotid stenting because this procedure crosses multiple clinical specialties with each bringing a different skill set to the training table. For example, a vascular surgeon has a thorough cognitive understanding of vascular anatomy and management of carotid disease but may lack some of the psychomotor technical skills of wire and catheter manipulation and may be unfamiliar with management of the fluoroscope. Conversely, an interventional cardiologist will have the technical skill with catheter-based

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procedures but may not be as familiar with the anatomical and clinical management issues. A sound training strategy must ensure that both of these specialists and others are able to meet an objectively assessable minimum level of proficiency in all facets of the procedure.

State-of-the-art training in many other high-skill professions, such as aviation, involves virtual reality simulation. First proposed as a method for surgical procedural skills training in 1991 by Satava,[6] acceptance of this training approach has been slow partly because of skepticism within the medical community and the lack of well-controlled clinical trials to demonstrate its efficacy. Frequently referred to as virtual reality (VR) training for the operating room (OR), "VR to OR" is the benchmark study for any medical virtual reality simulator. In the last 2 years, 2 such studies have been reported using a prospective, randomized, double-blind design and have shown that residents who were trained using a low-fidelity virtual reality trainer made significantly fewer intraoperative errors than a standard-trained group during the performance of laparoscopic cholecystectomy.[7,8] The first of the studies[7] showed that virtual reality–trained residents made 6 times fewer intraoperative errors and performed the procedure 30% faster when dissecting the gallbladder from the liver bed. What both trials demonstrated is that a significant part of the learning curve can be acquired through virtual reality training outside the OR. While all of the trainees in these studies were residents, when their videorecorded operative performance was compared with that of experienced attending surgeons, the performance of the trained resident did not differ significantly from that of the attending physicians. That is, the residents had acquired technical skills through training on a virtual reality simulator that approximated those of experienced attending surgeon operators.

The fidelity of the virtual reality simulators available for training in carotid stenting is orders of magnitude superior to the virtual reality trainer used in these 2 studies.[7,8] The endovascular virtual reality simulators produce a look and feel that closely approaches working on an actual patient.[9] In addition, these simulators measure and record every catheter and wire movement and can distinguish correct from incorrect movement sequences. Therefore, for the first time in endovascular medicine this technology can be used to train and assess complex, minute wire and catheter skills. Furthermore, the trainee physician can receive objective feedback on his/her performance during and after completion of the simulated cases to enhance and speed learning.

Rather than relying on crude surrogate measures of skill such as number of procedures performed or duration of training, specific procedure performance skills can be taught and assessed objectively. Furthermore, a technical skills benchmark or proficiency level can be set based on the objectively assessed performance of experienced operators performing the same task, and trainees can be required to reach that proficiency level before they ever deploy a carotid stent in a patient.[5] In fact, this training method is one of the primary reasons for the success of the "VR to OR" studies.[7,8] This method ensures a much less variable skill set and removes subjectivity from the training process. This objective training and assessment strategy can also serve to eliminate arguments among specialties regarding training and credentialing. As long as a vascular surgeon, cardiologist, interventional radiologist, or neurosurgeon can demonstrate the desired proficiency level, he/she should be allowed to perform the procedure.

Medicine is currently undergoing a shift in the way procedural skills are taught. In March 2004 we met with the FDA at a closed-door meeting to inform officials of the evidence that currently exists demonstrating the power of virtual reality simulation for improved medical intraoperative skills training and objective skills assessment and how virtual reality simulation should be applied. At a public meeting in April 2004, an FDA panel voted to accept a proposal that virtual reality simulation would be an important component of a training package for carotid stenting.[10] The company manufacturing the carotid stent system would work with physician trainers to educate physician trainees using a tiered training approach including online, multimedia components. Trainees would learn catheter and wire handling skills on a high-fidelity virtual reality simulator until the trainees achieved a level of proficiency in didactic and technical skills.

In August, the Society for Cardiovascular Angiography and Interventions, the Society for Vascular Medicine and Biology, and the Society for Vascular Surgery, representing the majority of physicians who will perform carotid stent procedures, publicly supported the use of virtual reality simulation for carotid stent training. They also included simulation as part of a joint competency statement.[11] On September 1, the Centers for Medicare & Medicaid Services announced its intention to expand coverage of percutaneous transluminal angioplasty of the carotid artery with placement of an FDA-approved carotid stent and to permit coverage for participants in a large FDA-mandated postmarket approval study for the newly approved device.[12]

A carotid stenting trial, which began in fall 2004, will explicitly assess the efficacy of virtual reality simulation to train physicians to place a carotid stent.[13] In this trial, physician trainees with no prior carotid stenting experience will be trained to an objectively established level of proficiency on a virtual reality simulator prior to performing stenting in a patient. In this study of training for a high-risk, high-profile procedure, the clinical outcomes of the patients of the virtual reality–trained physicians will be compared with a case-matched group of patients who had their carotid stent inserted by experienced operators as part of the trial responsible for FDA approval of the carotid stent. This is by far the largest and most important investigation of the role of virtual reality for procedural skills training ever conducted.

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The skills required for the practice of modern procedure-based medicine are frequently so difficult to learn that traditional training is no longer acceptable, and learning on patients is increasingly suboptimal. Eleven years after Satava[6] reported his vision of virtual reality for training procedural skills in minimally invasive surgery, this technology and proficiency-based training method are beginning to change the training paradigm in all of procedural-based medicine. Hereafter, physicians performing the procedure on patients for the first time will have a more homogeneous skill set, which will lead to safer, objectively assessed intraoperative performance. The ultimate goal is for this shift in procedural skills training to result in improved quality of care for patients.

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EDITORIALS

Editorials represent the opinions of the authors and THE JOURNAL and not those of the American Medical Association.

Lung Cancer Etiology

Independent and Joint Effects of Genetics, Tobacco, and Arsenic

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Duncan C. Thomas, PhD

LUNG CANCER IS THE NUMBER ONE NEOPLASM IN THE world, both in terms of incidence and mortality.[1] The incidence of lung cancer differs by geographic area, sex, age, and over time,[1,2] reflecting the effect of the underlying distribution and trend in use of its principal determinant, tobacco smoking. Although 80% to 90% of lung cancer cases occur in current or past tobacco smokers, only a small fraction of smokers (1%-15%) develop lung cancer,[2] depending on how much and how long an individual has smoked and the presence of other causes of lung cancer. Clearly, because all lung cancers do not occur in smokers and the vast majority of smokers do not develop lung cancer, other etiological factors can independently (in the absence of smoking) or jointly (in conjunction with smoking) cause lung cancer, beyond the purely stochastic nature of the disease process. These factors include genetics (measured as family history),[3,4] arsenic exposure,[5-8] radiation exposure, and other environmental carcinogens.[2] Although genetic factors probably contribute in all populations, the contribution of other factors is population-

See also pp 2977 and 2984.

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Virtual reality training for the operating room and cardiac catheterisation laboratory

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Context High-profile cases of medical errors in the USA and UK, and major reports from organisations such as the US Institute of Medicine and UK Senate of Surgery, have sensitised the public and medical profession. Training is a key area that must be tackled to positively affect the problem of medical errors, especially in surgery and interventional cardiology. Despite the radically novel skills required for minimally invasive surgery or interventional cardiology, current training has gone largely unchanged. At the end of the 20th century, the public and the medical profession have concluded that training on patients is no longer acceptable.

Starting point Recently, Teodor Grantcharov and colleagues (*Br J Surg* 2004; 91: 146–50) did a randomised double-blind trial which showed that training by virtual reality (VR) significantly reduces objectively assessed intraoperative errors in laparoscopic cholecystectomy. They used a low-fidelity VR simulator. Much more sophisticated VR simulators exist for endoscopy, gynaecology, laparoscopy, orthopaedics, otolaryngology, robotics, and urology. There are few studies on the efficacy of these simulators in improving the safety of procedures on patients.

Where next There needs to be more large and multicentre studies. Technical skills training for procedural based medicine continues to be an ad-hoc mentor-based experience for the trainee, with experience gained by practising on patients. The skills required now are so difficult to learn that this type of training is no longer acceptable. VR-simulator-based training does work, but further empirical evidence is required to convince the more conservative members of the medical community.

Medical errors have been blamed for 44 000–94 000 deaths a year in the USA.[1] The *To Err is Human*[1] report in the USA, the Bristol case[2] in the UK, and a mandate by the US Government to reduce health-care errors have brought this issue to the forefront for clinicians and the public. Many medical errors are caused by human factors associated with invasive image-guided techniques.[3] Examples include arthroscopy, laparoscopy, flexible endoscopy, and catheter-based techniques ranging from diagnostic angiography to complex vascular interventions (angioplasty and stenting).

Physicians do these procedure while looking at a monitor, with instruments that pass through tiny incisions in the body wall. This minimum invasion has considerable advantages for the patient (less trauma), but makes the operator's job more difficult. Operators have lost the ability to see and feel tissues directly, which means that the quality of what they see and feel is degraded. The physician has also lost the dexterity of joints in his or her hand, wrist, and fingers. Learning the hand-eye co-ordination of instruments, catheters, and guide wires is difficult because of the counter-intuitive movement of instruments due to the fulcrum effect of the body wall.[4] This proprioceptive-visual conflict takes the operator's brain time to overcome.

Despite these problems, most current medical training continues in the traditional mentored method, where trainees are exposed to procedures with the guidance of an experienced teacher.[5] The experience is unstructured, being dictated by the random admission of patients rather than a consistent exposure to all the fundamental medical problems. Furthermore, current training lacks objective feedback on trainees' performance.[6]

Virtual reality training for medical procedures

The state of the art for training in many other high-skill professions is virtual reality (VR). VR was probably best defined[7] as a communication interface based on interactive three-dimensional visualisation which allows the user to interact with and integrate different sensory inputs that simulate important aspects of real-world experience. VR allows more than observation, which has important implications for teaching. First introduced to surgery in 1991,[8] acceptance of VR training has been slow, partly because of scepticism within the medical community but also due to the lack of well-controlled clinical trials. Frequently referred to as VR training for the operating room (OR), VR-to-OR is the benchmark study for any medical VR simulator. In a recent randomised double-blinded design, Teodor Grantcharov and colleagues[9] showed that residents who were trained with VR made significantly fewer intraoperative errors during laparoscopic cholecystectomy than a standard-trained group. This study replicates findings from Yale,[10] in which the VR-trained group made six times fewer intraoperative errors and were 30% faster than the control group. Although the numbers of participants in both studies were small, the statistical power of the differences in the Yale study, for example, were large (means: VR-trained 1·7, standard-trained 7·4; $p<0·001$).

These studies have had an enormous effect on training in the USA. The American College of Surgeons has taken a clear position on VR simulation and published a white

paper[1] outlining overwhelming support for simulation in the drive to improve patients' safety. VR in cardiology has arrived at the same position as minimally invasive surgery, almost overnight. The driving force has been the introduction of carotid stenting, which is emerging as a viable alternative to carotid endarterectomy in high-risk patients.[11] This procedure was approved by the Food and Drug Administration (FDA) for the USA on Aug 31, 2004. Carotid stenting requires different techniques from invasive cardiac surgery and has previously been done by only a few experienced operators. Operators who wish to learn this procedure will not train on real patients, but on virtual patients. VR training will be an FDA requirement before credentials are granted, a real shift in medical training. One of the simulators that physicians will train on is the Vascular Interventional System Training (VIST), which simulates the physics and physiology of the human cardiovascular system. VIST also provides visual and haptic feedback, similar to that which a physician would see and feel for real. In general, the virtual catheter and wire has a one-to-one correspondence with the operator's interaction with no noticeable delay in visual feed-back.

VR training for clinical practice

One of the major advantages of VR for training technical skills is that the opportunity to train is constantly and consistently available. Another advantage is that the trainee can make mistakes without exposing the patient to risk, unlike in vivo. However, simulation as a training tool often seems to be poorly understood by users. It is widely assumed that if an individual just trains on a simulator, their technical skills improve. From an evidence-based medicine perspective, this assumption is flawed. VR simulation overcomes this problem by allowing a detailed assessment of technical skills during performance, which is an ideal situation for learning. It also allows trainers to track and measure the trainee's learning curve.[12] This learning curve should be done in the laboratory before allowing access and risk to patients in the operating room or catheterisation laboratory.

Metrics

For some time many physicians believed that only a simulator that looked and felt like a real patient could substitute for the in-vivo clinical experience. Both VR-to-OR studies[9,10] showed this belief to be wrong—even a low-fidelity VR simulator can dramatically improve clinical performance. The fidelity of the simulation should be appropriate. For laparoscopic cholecystectomy where immediate clinical risk to the patient is low, a low-fidelity simulator trains safe skills. For work in the carotid arteries where the risk to the patient of stroke or death is high, a much higher level of simulation fidelity is required to train safe skills. However, VR should be used to augment clinical experience not replace it, because no amount of simulation will recreate the experience of procedures on patients. VR should be used to replace the early part of the learning curve, which would otherwise be achieved in the clinical situation by practising live. The power of simulation is that it allows for the procedure to be broken

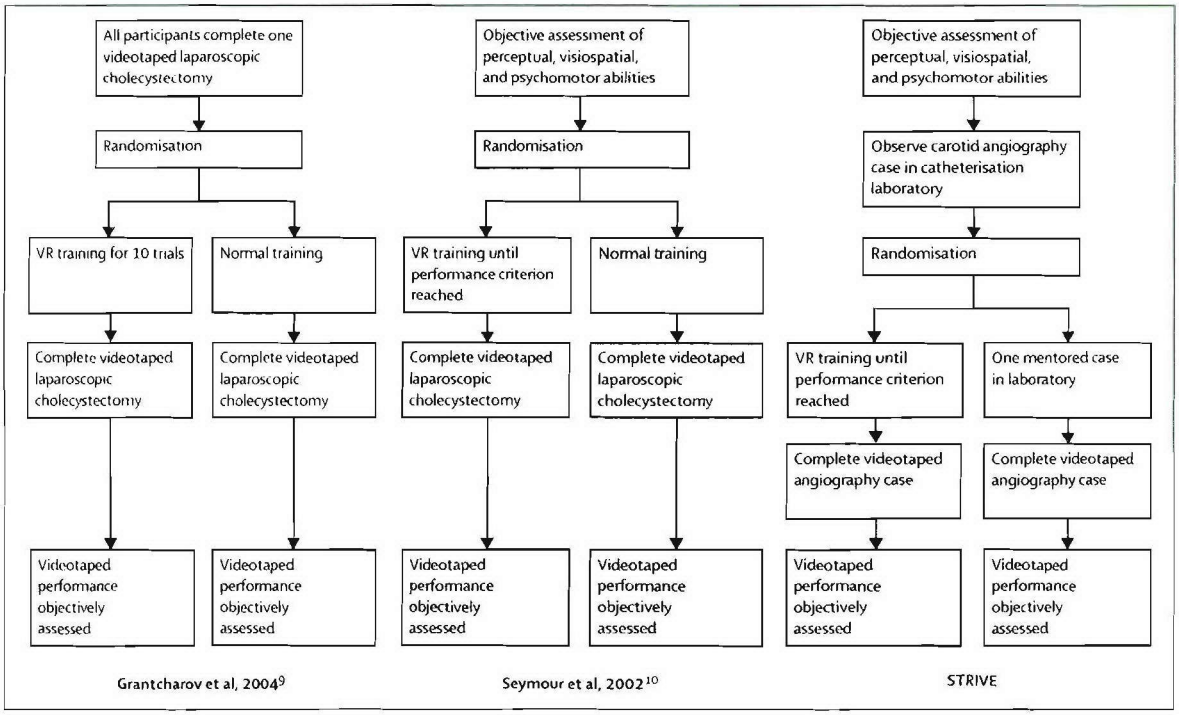

Figure: **Design of two VR-to-OR trials, and of carotid angiography VR-to-catheterisation laboratory STRIVE trial**
STRIVE=Simulator Training Randomized Vs Interventional Vascular Experience.

down into component parts, with measuring of the important technical aspects that define success and separate novices from experts.

An optimum approach to using simulation for training would be to first establish an objective benchmark on the simulator, based on the performance of experienced operators, and then require trainees to train until they reach the benchmark consistently (eg, two consecutive trials). The two goals of training should be to improve technical performance, and have trainees perform consistently well. Requiring trainees to train until they reach the benchmark ensures that all of those who complete training have reached at least this proficiency, thus reducing the variability of skill that the physician takes into the clinical situation. This level means that the trainee should have automated the hand-eye-foot co-ordination of instruments on the monitor before they ever apply their skills in vivo. It also means that they can devote these cognitive resources to doing the actual procedure and taking guidance from the expert physician rather than focusing entirely on what their hands are doing.[13] High-fidelity simulators, such as Lap Mentor and VIST will enhance these training effects even further.

Now and the future

Interventional cardiologists, radiologists, and endovascular surgeons have the opportunity to learn carotid stenting on a full procedural VR simulator.[14] The complete simulation package probably represents the most advanced VR for medical simulation in the world today. The implication of having this quality of simulation and objective metrics readily available is that only physicians who clearly show proficiency on the simulator will be approved to do the procedure on patients. It also means that a physician's technical skills and even clinical judgment can be regularly assessed throughout their career.[15] VIST is also the first VR simulator that allows a physician to rehearse a difficult procedure before doing the procedure in vivo—mission rehearsal.[16]

The potential of VR for patients' safety, improved training, and the development and roll-out of new procedures is exhilarating.[17] However, truly demonstrating the value of this technology as a training device will require several well-controlled trials. The figure shows the study design of the two VR-to-OR studies[9,10] that have been published, and our in-progress carotid angiography VR-to-catheterisation laboratory STRIVE trial. STRIVE combines the strengths of both studies with an objective assessment on the front end and an in-vivo case-experience before randomisation. The VR group will then train on VIST until they reach the performance criterion or proficiency level set by the experts, while the standard-trained group will complete one mentored case in the catheterisation laboratory. Both groups will then complete a carotid angiography supervised by an attending cardiologist blinded to training status. This procedure will be video-recorded (fluoro-image and exterior hand views) and assessed by two cardiologists blinded to training status. These raters will have been trained to score performance for explicitly defined errors (ie, deviations from safe clinical practice) with over 0·8 inter-rater reliability. Unlike the other two VR-to-OR studies, all our participants will be experienced interventional cardiologists. We predict that the VR-trained group will do as well or better than the standard-trained group.

Good-quality simulators already exist for interventional procedures in flexible endoscopy, laparoscopy, arthroscopy, otolaryngology, robotics, and endovascular procedures. Although some are a decade old,[18] there are embarrassingly few studies that unequivocally show the value of simulation for improving operators' performance. After a decade, this situation is now changing but additional studies are needed.

We declare that we have no conflict of interest.

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RT III

"A Tale of Two Centers (—Part II)"

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- **Learning Objectives:**

At the end of this session, participants will understand:

1. The concept of an integrated, collaborative, multidisciplinary center focused on fostering excellence in experiential education, practice, and research applications of simulation modalities
2. Two case studies of the process of simulation center creation

Presentation summary:

At IMMS 2001, Drs. Ziv and Dunn co-chaired a workshop entitled "A Tale of Two Centers". At that time, it was recognized that the concept of creation of a "multidisciplinary" simulation center was shared in virtually identical fashion between the (then existing) Israel Center for Medical Simulation (Chaim Sheba Medical Center, Tel Hashomer, Israel) and the (conceptualized) Mayo Multidisciplinary Simulation Center. The 2001 workshop contrasted the "top-down" approach to simulation center creation at Chaim Sheba to the "bottom-up" approach, then underway at Mayo for nearly three years.

At IMMS 2006, the co-chairs of this event present "A Tale of Two Centers (—Part II)". With the opening of the Mayo Multidisciplinary Simulation Center October 1, 2006, the processes, reflections, relative merits, and available data comparing the visions and impact of these centers will be shared, as possible models to be replicated elsewhere.

References, selected readings, websites of note etc:

As this is primarily a presentation of two case studies, participants are welcome to come, reflect, challenge, query, share, and imagine the future of evolving impact for these and other centers, in collaboration. There are however, no recommended readings or references, beyond the websites of the two institutions discussed.

http://eng.sheba.co.il/main/siteNew/index.php?page=45&action=sidLink&stId=435

http://www.mayo.edu/simulationcenter/index.html

RT IV
Pro-Con Debate

High Fidelity Simulation Should be Used for Examination?

William Dunn, Lisa Sinz

RT V
Pediatrics

Moderator: Peter Weinstock

• TATRC Support to Medical Simulation Research

- Faculty name and academic/institutional/agency affiliation

  - Gerald R. Moses, PhD; Chief, Clinical Applications Division, Telemedicine and Advanced Technology Research Center;
  - Fort Detrick, Maryland

  - Randy Haluck, MD; Director, Minimally Invasive Surgery; Hershey Medical Center, Penn State University; Hershey, Pennsylvania

  - Joe Harvey Magee; Clinical Applications Division; Telemedicine and Advanced Technology Research Center; Fort Detrick, Maryland

  - Amy Nyswaner; Clinical Applications Division; Telemedicine and Advanced Technology Research Center; Fort Detrick, Maryland

- Learning Objective *(required by ACCME)*

Attendees of this session will focus on true technical solutions to simulation training as a means to advance the field. Many learning, educational, curriculum, adoption, implementation, and validation issues will be identified that need to be solved to go hand-in-hand with the technology. The audience at IMMS may also address or solve some of these problems with techno solutions that will benefit a broad audience.

- Presentation summary/outline

Representatives of the TATRC will present a review of their research portfolio in medical simulation. They will provide information about the history of the TATRC medical simulation research portfolio, a demonstration of current managed projects, and information related to establishing partnership with the organization. Finally, there will be discussion of future research needs and opportunities, focusing upon enabling of technologies to enhance medical simulation training.

- References, selected readings, websites of note etc.

A Report of an Integrated Research Team Meeting on Military Medical Simulation Training, February 16-18, 2000, Frederick, Maryland. (www.tatrc.org)

A Report of an Integrated Product Team Meeting on Medical Simulation, Proceedings from the conference, Advanced Technology Applications to Combat Casualty Care, August, 2004, September, 2003

RT VII

Emergency Medicine Roundtable: *Simulation in Emergency Medicine: Value, Challenges and Innovation*

Faculty: Robert Wears, MD, MS
University of Florida / Imperial College London

Mary Patterson, MD, MEd
Cincinnati Children's Hospital

Learning Objective: Participants will develop an improved understanding of the value of and unique challenges of using simulation in emergency medicine. Participants will be encouraged to discuss obstacles and brainstorm for solutions to these issues.

Presentation summary/outline:

1. Assessment of current experience and use of simulation among participants.
2. Value and use of simulation in emergency medicine
   a. technical skills (procedures)
   b. non-technical skills (e.g. behavioral, CRM)
3. Challenges that are unique to using simulation in the emergency setting
4. Innovation /Untapped uses of simulation in the emergency setting
   a. Maximizing usability
   b. Improving the bottom line

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Roundtable VII-Simulation Center Operations

Moderators:

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- Guillaume Alinier, MPhys, PGCE, CPhys, MInstP, ILTM—Hertfordshire Intensive Care & Emergency Simulation Centre Coordinator, Faculty of Health & Human Sciences, University of Hertfordshire, Tel: +44 (0) 1707 286395, Email: G.Alinier@HERTS.AC.UK

Learning Objectives:

1. The participant will learn about the planning, logistics, and operation of a simulation center, including tricks and tips of the trade.
2. The participant will be able to exchange ideas and share experiences with other simulation center operators.
3. The group will establish an ongoing system for networking and collaborations between simulation centers, creating leadership roles at the annual simulation meetings.
4. The group will generate topics for future meetings and workshops.

Description:
This is a roundtable discussion for simulation center coordinators, managers, operators, technicians and directors of operations. Medical directors who are also simulator operators are welcome. The purpose is twofold: to discuss issues encountered during the operation of a simulation center and to build a network of support among the operators.

Agenda:

1. Introduction and overview
2. Operational infrastructure of a simulation center—the common issues
    a. Funding (start up and maintenance, personnel salaries)
    b. Logistics (space, equipment troubleshooting/maintenance, scheduling)
    c. Program development—scenario development, curriculum incorporation, marketing within/outside school, expansion/multidisciplinary training
    d. Research (data management, videotaping, multi-center project)
3. Break out in small groups (by discipline)—generation of ideas/data (designate note-taker)
    a. What is your job title/degree?
    b. What are your job description and training/skills/educational background?
    c. What are your center's training mission and target audience?
    d. Which simulators do you have and how many?
    e. What is a typical day/week like?
    f. What would you like to get out of this group (generate list of goals)?
    g. How can you contribute to the group?
    h. Share experiences, tips, ideas, contacts, etc.—create contact list
4. Reconvene as a group to share findings
5. Development of the group at annual meetings
    a. Discuss planning group and member roles—commitment to follow up after returning to busy schedules
    b. Continuing education for operators—leaders and topics needed
    c. Do we need a separate sim coordinator list serve? What about sharing information on the SMS website?

References: Useful websites, articles and simulation tips will be shared at the discussion.

2006 IMMS Workshop Schedule

Title and Corresponding Author Listing

See following pages for workshop descriptions

Chair: Michael Devita
Committee: Yaron Munz, Byron Baxendale, Betsy Bencken, Ellen Pringle, Patricia Myers, Jordan Halasz, Grace Huang

Sunday Workshop Session I			
1393	3:15-4:00	Naut 4	Baby(Sim)'S First 6 Months *Judith Hwang UC Davis Health System Sacramento CA*
1411	3:15-4:00	Naut 5	Evaluating Perceived Self Efficacy After Simulation Lab Experience On The Assessment Of The Cardiovascular System In Entry Level Nursing Students *Jackie Michael UT Arlington, School Of Nursing Garland TX*
1374	3:15-4:00	HI 2	What To Do With The Upset Participant: Creating A Challenging Yet Safe Learning Environment *Simon Center For Medical Simulation Cambridge MA*
1372	3:15-4:00	SeaBr	Audio & Video For Simulation *Richard Kyle PSL/USU/DOD Bethesda MD*
1373	3:15-4:00	Spin	Creating Simulator Scenarios With Intelligent Help And Automated Debriefing For Critical Care Medicine, Obstetrics And Pediatrics *Howard Schwid University Of Washington Seattle WA*
day Workshop Session II			
1386	4:30-5:15	Naut 4	Optimizing Performance In Pediatric Simulation: From Essentials To Advanced Applications *Peter Weinstock Childrens Hospital Boston Boston MA*
1436	4:30-5:15	Naut 5	A Novel Birthing Simulator For Training In And Assessment Of Fetal Mechanical Response To Shoulder Dystocia Delivery Techniques *Edith Gurewitsch Johns Hopkins University Baltimore MD*
1368	4:30-5:15	HI 2	Use Of Web-Based Resources During Debriefings To Illustrate Preclinical And Clinical Lessons On The Human Patient Simulator *John Pawlowski Beth Israel Deaconess Medical Center Boston MA*
1423	4:30-5:15	Spin	A Virtual Laparoscopic Simulator Used As Training Device For Beginners By Introducing A Novel Score System. *Joerg Beardi Mainz Rheinland Germany*
1372	4:30-5:15	SeaBr	Audio & Video For Simulation *Richard Kyle PSL/USU/DOD Bethesda MD*

Nautilus 4 & 5 are on the lower level

Harbor Island, Seabreeze and Spinnaker are on the main level

Monday Workshop Session III			
1394	2:45-3:30	Naut 4	Introducing The Pelvic Examination To First Year Medical Students *Betsy Bencken University Of California, Davis Health Sacramento CA*
1406	2:45-3:30	Naut 5	An Overview Of Design, Content And Scoring Considerations For A Simulation-Based Performance Assessment *David Murray Washington University In St Louis St Louis MO*
1403	2:45-3:30	HI 2	Training For Shoulder Dystocia: Development Of An Obstetric Training Manikin And 'Hands-On' Demonstration Of Its Use In Obstetric Simulation *Joanna Crofts Department Of Obstetrics And Gynaecology Bristol Bristol United Kingdom*
1452	2:45-3:30	SeaBr	Serious Games: The Oxymoron Problem *Jeffrey Taekman Duke University Medical Center Durham NC*
1465	2:45-3:30	Spin	Creation Of Structure-Function Relationships In The Design Of A Simulation Center *Brian Brost Mayo Clinic College Of Medicine Rochester MN*
Monday Workshop Session IV			
1420	3:45-4:30	Naut 4	Teaching Closed Loop Anaesthesia In Simulation *Jochen Vollmer Simulationszentrum Mainz Mainz RLP Germany*
1443	3:45-4:30	Naut 5	Train Where You Work – Aspects Of Mobile "In-Situ" Simulation Training *Peter Dieckmann Center For Patient Safety And Simulation Tuebingen Baden-Würt Germany*
1381	3:45-4:30	HI 2	Assessing And Documenting Competency In Advanced Resuscitation Skills Using Screen-Based Simulation *Kathleen Ventre Primary Children\'S Medical Center Salt Lake City UT*
1427	3:45-4:30	Spin	Rating Surgeons' Behaviours In The Operating Room Or OR Simulator *Steven Yule University Of Aberdeen Aberdeen Grampian United Kingdom*
1390	3:45-4:30	SeaBr	Rapid Construction Of Interactive Simulations In Web Pages Using Numberlinx *Mailen Kootsey Loma Linda University Loma Linda CA*
Monday Workshop Session V			
1410	4:45-5:30	Naut 4	Wireless Drug Recognition In Simulation *Wolfgang Heinrichs Klinik Fuer Anaesthesie Mainz Rheinland- Germany*
1369	4:45-5:30	Naut 5	A Systematic Standardized Approach To Raising OBGYN Residents' Baseline CREOG Competencies Through Clinical Simulation *Kimberly Van Walsum Scott & White Memorial Hosp/TAMU COM Temple TX*
1456	4:45-5:30	HI 2	Interventional Vascular Simulation – The Use Of Simulators In Interventional Cardiology Training And In Teaching Of New Devices And Procedures *Giora Weisz CIVT, Columbia University Medical Center New York NY*
1439	4:45-5:30	Spin	Innovation In Simulation For Field And EMS Training *Les Becker Pacific Institute For Research And Evalu Calverton MD*
1400	4:45-5:30	SeaBr	The Design Of An Endoscopic Surgical Simulation Training Curriculum In An Obgyn Residency Program *Marshall Smith Banner Good Samaritan Medical Center Phoenix AZ*

2006 IMMS Workshop Descriptions

Listed by Workshop Number

Workshop # 1368

Presentation date/time: Sun 4:30 - 5:15 HI 2

Use Of Web-Based Resources During Debriefings To Illustrate Preclinical And Clinical Lessons On The Human Patient Simulator.

John Pawlowski[1,2], David Feinstein[1,2]
[1]Gilbert Program in Medical Simulation, Harvard Medical School, [2]Dept of Anesthesia, Beth Israel Deaconess Med Ctr, [3]Dept of Emergency Medicine, Mass General Hospital

This workshop will focus on cool educational resources that are available to assist in the debriefing that follows a mannequin-based simulation exercise.
Participants will receive web site addresses as well as examples of dramatic and visually-appealing materials.
Participants will be asked to describe simulator scenarios and create new debriefing techniques and illustrations.
This workshop hopes to make the debriefing as technically sophisticated as the scenario.

Category of Simulation: Computer-based
Learning Objectives:
#1 Discuss debriefing techniques
#2 Discover web-based educational sites
#3 Craft sophisticated debriefing sessions

Workshop # 1369

Presentation date/time: Mon 4:45 - -5:30 Naut 5

A Systematic Standardized Approach to Raising OBGYN Residents' Baseline CREOG Competencies Through Clinical Simulation.

Jose F. Pliego[M.D.], Kimberly L. van Walsum[Ph.D. MEd.]
[1]Texas A&M University System Health Science Center/College of Medicine, [2]Scott & White Memorial Hospital

This interactive workshop will allow participants to implement a simulation curriculum designed to teach CREOG required competencies to OBGYN residents in a standardized, replicable manner prior to the assumption of direct patient care responsibilities. Specifically, this curriculum is designed to teach residents in obstetrics and gynecology how to assess and manage common obstetrical emergencies, and common intrapartum fetal heart monitoring scenarios, through high fidelity clinical simulation enhanced by innovative combinations of available technologies. Workshop participants will gain the knowledge, skills and abilities needed to 1) set up and use innovative combinations of technologies to run key curriculum scenarios designed to expose learners to the most common obstetrical emergencies and intrapartum fetal heart monitoring events, and 2) implement simulation curriculum materials including complete clinical and technology specifications for innovative combinations of Noelle, SimMan, Metron and Corometrics Fetal Heart Monitor equipment.

Category of Simulation: Mannequin-based
Learning Objectives:
#1 Describe how systematic exposure to common obstetrical and intrapartum fetal monitoring scenarios represents an improvement over traditional methods for teaching CREOG competencies
#2 Demonstrate two innovative combinations of simulation technologies for teaching and evaluating CREOG competencies in the assessment and management of common obstetrical emergencies and common intrapar
#3 take home and implement curriculum materials, scenario information, and evaluation/debriefing instruments for running high fidelity clinical simulations to enhance OBGYN residents' acquisition of required skills

2006 IMMS Workshop Descriptions

Listed by Workshop Number

Workshop # 1372

Presentation date/time: Sun 3:15 - 4:00 and 4:30 - -5:15 SeaBr

Audio & Video for Simulation.

Richard Kyle[1], Chuck Miller[2]
[1]US Federal Government, [2]KB Port

Why have A/V in Simulation at all?
How much performance is needed?
How much $$$ will this cost?
How to approach A/V design, installation & use.

Requirements for participants

1. bring a written list of
a. who you students are (level and numbers)
b. what are your teaching objectives for them.
2. bring a written list of the functions you want your A/V system to do for you.
3. bring a diagram (hand drawn is good enough) of your current sim layout (or desired sim layout) including location and size of clinical, control, debrief and storage rooms.

For the participant that has done a complete job of #1, 2, 3, we shall create working examples, using A/V gear, of the ways in which A/V can be used to help meet their needs.

Category of Simulation: Standardized Patient
Learning Objectives:
#1 How much A/V performance is needed?
#2 How much $$$ will this A/V performance cost?
#3 How to approach A/V design, installation & use.

Workshop # 1373

Presentation date/time: Sun 3:15--4:00 Spin

Creating Simulator Scenarios with Intelligent Help and Automated Debriefing for Critical Care Medicine, Obstetrics and Pediatrics.

Howard A. Schwid
University of Washington School of Medicine

This is a highly interactive workshop. Participants will explore a generalized screen-based simulator program for medical emergencies. Participants will add and delete elements of the graphical user interface to handle the specific needs of critical care, obstetric and pediatric scenarios. Participants will create a list of teaching cases and develop finite state machine driven scenarios for each of these medical specialties. Participants will use a case authoring system for the simulator program to build a scenario, provide intelligent help during the case simulation, and provide automated debriefing following the case simulation.
In addition to critical care medicine, obstetrics and pediatrics, participants will be given the opportunity to modify the simulator program and list scenarios for other medical specialties. Participants will also learn how to translate their screen-based scenarios for use with mannequin-based training.

Category of Simulation: Computer-based
Learning Objectives:
#1 Design the GUI for critical care, obstetric and pediatric simulators.
#2 Learn the fundamentals of finite state machine simulations.
#3 Create a list of teaching cases and build one scenario for each of these specialties.

2006 IMMS Workshop Descriptions

Listed by Workshop Number

Workshop # 1374

Presentation date/time: Sun 3:15 – 4:00 HI 2

What to do with the upset participant: Creating a challenging yet safe learning environment.

Daniel B. Raemer[1,2,3], Jenny W. Rudolph[1,4], John Pawlowski[1,5], Elaine C. Meyer[3,6], Robert Simon[1,2,3]
[1]Center for Medical Simulation, Cambridge, Massachusetts, [2]Department of Anesthesia and Critical Care, Massachusetts General Hospital, [3]Harvard Medical School, [4]Boston University School of Public Health, [5]Department of Anesthesia, Beth Israel Deaconess Medical Center, [6]Medical Surgical Intensive Care Unit, Children's Hospital Boston

High-fidelity simulation environments often challenge participants with lifelike cases that force them to practice healthcare at the edge of their expertise. These experiences can have an unpredictable emotional impact on participants. Good design of scenarios, including an analysis of the participants' capabilities is an essential step in providing engaging and challenging educational opportunities. But good design is often not enough. Participants can become upset, even traumatized, when they think they did poorly in a scenario. This workshop will provide simulation instructors with: (1) strategies for creating a safe environment that will help minimize the chance that participants will have a negative reaction in the first place, (2) strategies to handle distressed participants and to assess the need for follow-up, and (3) ideas for institutional safeguards.

Category of Simulation: Mannequin-based
Learning Objectives:
#1 Learn how to set up teaching environment to minimize the chances of needlessly upsetting a student
#2 Learn techniques to mitigate the effects of an upset student
#3 Understand the power of emotions in a simulation environment

Workshop # 1381

Presentation date/time: Mon 3:45 – 4:30 HI 2

Assessing and Documenting Competency in Advanced Resuscitation Skills Using Screen-Based Simulation.

Kathleen M Ventre MD[1], Howard Schwid MD[2]
[1]Critical Care Medicine, Primary Children's Medical Center, Salt Lake City UT USA, [2]Department of Anesthesiology, University of Washington, Seattle WA USA

Anesoft ACLS Simulator, version 6, includes an automated debriefing system that generates a detailed commentary on correct and incorrect decisions made during the simulated case and assigns a numeric score for overall performance. We modified ACLS Simulator 6 to provide the ability to classify error patterns and produce data records to facilitate documentation of ACLS/PALS competency among hospital and transport staff. Errors in assessment, CPR, intubation, defibrillation/cardioversion, and drug or IV fluid administration are itemized in the summary report.
In this workshop participants will first learn how the automated debriefing system works and how to create new scenarios. Participants will then explore the error classification system and suggest modifications of the system for optimal documentation of competency. Finally, participants will discuss applications of the error classification database including improvement of existing training courses, revision of the frequency of skills review and retraining, and facilitation of competency assessment for clinical staff.
Category of Simulation: Computer-based
Learning Objectives:
#1 Learn the capabilities of the Anesoft screen-based ACLS/PALS Simulator, recently updated to include a competency assessment feature
#2 Explore ways in which screen-based simulation can be used to supplement traditional PALS and ACLS curricula
#3 Explore ways in which case outcomes data may be used to guide improvements in existing training programs

2006 IMMS Workshop Descriptions

Listed by Workshop Number

Workshop # 1386

Presentation date/time: Sun 4:30 – 5:15 Naut 4

Optimizing Performance in Pediatric Simulation: From Essentials to Advanced Applications.

Peter Weinstock MD PhD[1,2], Liana Kappus MEd[1], Barry Grenier RT[1], Susan Hamilton-Bruno RN[1]
[1]Childrens Hospital Boston, Boston MA 02115, [2]Harvard Medical School, Boston MA 02115

Workshop Objective: An overview of the essentials of pediatric program development followed by demonstrations/videos of advanced applications of pediatric simulation. The session will roll out in three parts: brief didactic introduction, hands-on simulation experiences, multimedia/video demonstrations and panel discussion.
1. Introduction:
- Getting Buy-in: The important role(s) of simulation in academic/clinical pediatrics.
- Current Pediatric Simulators: Limitations and solutions.
- Curricular Design: Teaching the gamut
- Usage Analysis: "If you build it, who will come?"
2. Demonstrations:
- Participants will engage in "teaching modules" which utilize innovative integrated pediatric simulator "add-ons" (e.g. active test lung, feeding tube) that enhance pediatric physiology and cosmetic accuracy.
- Pediatric simulation in the development of educational films.
3. Multidisciplinary Panel Discussion: "Making the whole greater than the sum of its parts"--Representatives from Pediatric Medicine, Nursing, and Respiratory therapy will lead a lively discussion describing his/her unique experience/perspective in developing and implementing pediatric simulation programs.

Category of Simulation: Mannequin-based
Learning Objectives:
#1 Review the essentials of pediatric simulation program development
#2 Discuss the obstacles to accurate pediatric simulation and the possible solutions
#3 Discuss the unique challenges of multidisciplinary training within pediatric subspecialties

Workshop # 1390

Presentation date/time: Mon 3:45 – 4:30 SeaBr

Rapid Construction of Interactive Simulations in Web Pages Using NumberLinX.

J Mailen Kootsey[1,2]
[1]Loma Linda University, [2]Simulation Resources, Inc.

NumberLinX is a new Java-based software technology that makes it possible to construct Web pages with interactive simulations without programming. A library of reusable input, output, control, and calculation objects is integrated into the Web design program Dreamweaver (Macromedia). Model equations and variables are entered into a separate program that writes the Java code necessary for calculations and prepares documentation for the model. Interactive simulations can include animated graphics for input or output. This workshop will feature building an interactive simulation with the NumberLinX technology as well as the demonstration of several other example pages and lessons built around interactive simulations. Attendees at the workshop will receive a copy of the NumberLinX software for building their own simulations for non-commercial educational use.

Category of Simulation: Computer-based
Learning Objectives:
#1 Be able to structure an interactive simulation as input-calculate-output.
#2 Know how to construct interactive simulations in Web pages using NumberLinX technology.
#3 Know best practices for using interactive simulations in Web pages.

2006 IMMS Workshop Descriptions

Listed by Workshop Number

Workshop # 1393

Presentation date/time: Sun 3:15 – 4:00 Naut 4

Baby(Sim)'s First 6 Months.

Judith C. Hwang, Thomas Engel, Peter M. Rutan
University of California Davis Health System, Center for Virtual Care

During this workshop, we will share the way the Center for Virtual Care is incorporating BabySim into our educational programs and discuss the growing pains we have experienced. We will have participants engage in a scenario that can be adapted for multiple disciplines. The forum will then be opened for discussion and to have others share their experiences.

Category of Simulation: Mannequin-based
Learning Objectives:
#1 Learn lessons from our experience
#2 Learn to care for an infant in distress
#3 Exchange experiences with others

Workshop # 1394

Presentation date/time: Mon 2:45 – 3:30 Naut 4

Introducing the Pelvic Examination to First Year Medical Students.

Betsy Bencken, Judith Hwang
University of California, Davis, Health System

Introducing the Pelvic Examination to medical students in the first year curriculum has always been challenging and in today's healthcare environment it is becoming increasingly difficult. In addition to being one of the more subjective skill sets, it is also difficult for the "patient" participant who must understand the skills that the student examiner is attempting to learn and be able to articulate an appropriate response that provides educational feedback for the learner. We introduced the students to the pelvic examination via "hands on simulation" prior to the standardized patient. With the development of the simulated model, it is possible to teach the exam in a factual manner without the discomfort of being in the presence of a real patient.

Category of Simulation: Task Trainer
Learning Objectives:
#1 Share lessons learned from our experience.
#2 Participants will gain some insight in utilizing the Examsim in their educational program
#3 Provide workshop participants hands on experience using the Examsim.

Workshop # 1400

Presentation date/time: Mon 4:45 – 5:30 SeaBr

Design of an Endoscopic Surgical Simulation Training Curriculum in an ObGyn Residency Program.

Marshall (Mark) Smith, John Mattox
Department of ObGyn, Banner Good Samaritan Medical Center, Phoenix, AZ

Simulation training of surgical skills alone is insufficient to train fully competent surgeons for the OR; there are other components of a surgical simulation curriculum necessary to train residents to become proficient surgeons. Simulation training in endoscopic surgery has been implemented into the ObGyn Residency Program at Banner Good Samaritan Medical Center, and current curricular concepts and basic components of this curriculum will be outlined. This will serve as a framework for an interactive audience discussion and learning exercise in the design of simulation training in surgical residency programs.

The basic traits that appear to be important for competency in a surgeon and will be covered are:
- Basic database of knowledge
- Surgical skills
- Cognitive decision-making
- Communication skills
- Leadership (team) skills

Each component will be presented with a brief review of simulation and medical curriculum data followed by an interactive discussion session with the audience.

Category of Simulation: Computer-based
Learning Objectives:
#1 Be able to list three components of a surgical simulation training curriculum necessary to train proficient surgeons
#2 Be able to list supportive data for including additional basic science training into surgical simulation curriculums and training
#3 Be able to list supportive data for including cognitive decision making training into surgical simulation curriculums and training

Workshop # 1403

Presentation date/time: Mon 2:45 – 3:30 HI 2

Training for Shoulder Dystocia: Development of an Obstetric Training Manikin and 'Hands-On' Demonstration of its use in Obstetric Simulation.

Joanna F Crofts, Timothy J Draycott
The SaFE Study, Department of Obstetrics and Gynaecology, Southmead Hospital, Bristol, UK

Shoulder dystocia (SD) is an unpredictable complication of childbirth with a high morbidity.
No high-fidelity models are currently available. Our aim was to develop a realistic mannequin to train staff, thereby reducing morbidity.
We developed a high-fidelity mannequin that accurately simulates SD and measures applied delivery force. The mannequin was used in a UK regional study of obstetric training. 140 staff were randomized to training on this mannequin or, training using locally available resources. Participants were evaluated using a simulated SD scenario pre and 3 weeks, 6 and 12 months post training. Evaluations were videoed; 364 are available for analysis.
The successful delivery rate increased from 58/132 to 110/132 ($P<0.001$). Successful delivery was significantly associated with high-fidelity training (OR 6.43 $P=0.002$).
The development process and evaluations will be discussed, including common errors observed, enabling educators to more accurately target future training. The mannequin will be available for delegates to use.

Category of Simulation: Task Trainer
Learning Objectives:
#1 Learn about the development process of an obstetric training manikin
#2 Observe, and participate in, a simulated shoulder dystocia scenario
#3 Receive training experience assimilated from observation of over 300 simulated births

2006 IMMS Workshop Descriptions

Listed by Workshop Number

Workshop # 1406

Presentation date/time: Mon 2:45 – 3:30 Naut 5

An Overview of Design, Content and Scoring Considerations for a Simulation-based Performance Assessment.

David Murray[1], Jack Boulet[2]
[1]Department of Anesthesiology, Washington University School of Medicine, [2]Educational Commission for Foreign Medical Graduates

Simulation exercises provide the means to train as well as evaluate health care professionals. In order to use simulation as an assessment method, instructors must consider scenario content, scenario design, applicable scoring methods, and then determine by analysis of participant performance whether the evaluation provides a reliable and valid assessment. This workshop will familiarize participants with characteristics and qualities of valid and reliable simulation-based assessments.

Simulation-based training can be used to assess a number of competence domains that are difficult to evaluate in clinical practice. Using specific examples, including videotaped performances, we will provide examples of effective as well as ineffective training exercises.
The workshop will review how objective and reproducible scoring systems are developed, with emphasis on, and examples of, the use of a Delphi approach. Comprehensive checklist scoring, commonly used for standardized patient assessments, as well as global, or holistic, scoring will be discussed with emphasis on strengths and weaknesses of these, and other, scoring methodologies.
Examples of detailed analysis of trainee performance will illustrate how these results offer insight into scenario content, evaluation criteria, rater effects, and the reproducibility and validity of the simulation scores.

Category of Simulation: Mannequin-based
Learning Objectives:
#1 Provide guidelines that can be used to assess the structure and content of scenarios used for objective assessment of performance.
#2 Rreview various scoring approaches and assess their strengths and weaknesses.
#3 Ilustrate how analysis of the trainee's performance offers insight not only into trainee skill, but also scenario design, scoring systems, and potential sources of measurement error.

Workshop # 1410

Presentation date/time: Mon 4:45 – 5:30 Naut 4

Wireless drug recognition in simulation.

Wolfgang Heinrichs, Stefan Mönk, Jochen Vollmer
University Mainz, Medical School

Besides airway management the application of drugs is one of the most important tasks that have to be performed in any kind of simulation scenarios. If we follow the results of several phsychologic studies that the best simulation environment is that with the highest degree of reality, it is obvious that the keyboard input of drugs (e.g. like in "megacode devices") is not desirable. Even the very precise drug recognition system from Meti is limited to barcode labeled syringes and to just one injection port. Vivid simulations require injection sites at any patient site and even intramuscular injections may be necessary.

The goal of this workshop is to analyze the various injection places and the gain of realism by an automatic drug recognition system during simulation. It is structured In 4 phases:
1. We present a 10 min scenario of a pulmonary emergency with keyboard input of drugs. The scenario is videotaped for analysis and feedback.
2. We identify the need of realistic simulation by having the possibility to puncture veins and do injections at

the hand, the forearm, the neck etc.
3. We present a ready to use system of wireless syringe devices (WSDs). The WSD is a little clip that holds a standard syringe. By wireless communication every movement of the syringe piston is transmitted to a computer system and automatically calculated into drug dosage and also automatically send to the simulator system.
4. Participants repeat the scenario using the WSDs. No other drug recognition is allowed. Again the scenario is videotaped. The gain of reality is then evaluated by analyzing the videotape and by using a standardized questionnaire.

Category of Simulation: Mannequin-based
Learning Objectives:
#1 Learn about a system on automated drug recognition (WSD)
#2 Identify the differences between manual and automated drug recognition
#3 Get feedback on the increase in simulation realism by the WSD

Workshop # 1411

Presentation date/time: Sun 3:15 – 4:00 Naut 5

Evaluating Perceived Self Efficacy After Simulation Lab Experience On The Assessment Of The Cardiovascular System In Entry Level Nursing Students.

Jackie Lall Michael
University of Texas at Arlington, Texas

Access to health care is identified as one of the ten leading health indicators in Health People 2010. We are facing yet another nursing shortage in the United States. Nursing programs across the nation are rising to meet the nursing needs, they are faced with many issues and challenges in nursing education. Some of the current issues in nursing education are shortage of nursing faculty, diverse student population, larger number of students in the classroom, shortage of clinical sites, expectation from the new graduate nurse from the potential employers in the community and most importantly the preparation of the graduate nurse who has the critical thinking skills to be an independent, safe and competent practitioner. Nursing education is turning to simulation to provide effective, efficient and innovative ways to educate future nurses. The impact of simulation as a teaching method on nursing education and curricula is yet to be established.

Category of Simulation: Standardized Patient
Learning Objectives:
#1 Discuss benefits of traditional assessment lab versus simulation lab experiences.
#2 Discuss uses of simulation instruction in nursing education.
#3 Discuss uses of simulation instruction in a Holistic Health Assessment course.

Workshop # 1420

Presentation date/time: Mon 3:45 – 4:30 Naut 4

Teaching Closed Loop Anaesthesia in Simulation.

Jochen Vollmer, Wolfgang Heinrichs, Stefan Mönk, Thomas Semmel Griebeler
Simulationszentrum Mainz, Germany

Closed loop drug application is one of the next challenges in the field of anesthesia. Current designs of Closed Loop Applications (CLA) consist of a device measuring the effect of drugs (e.g. EEG Monitors), a control algorithm, and an automated drug delivery system like TCI pumps.

These techniques follow a new approach in medical practice and there is a need for validation of the devices and for training in the usage of CLA.

In this workshop we will develop key components of teaching CLA on a simulator and we discuss the possibilities and the limitations of CLA on a simulator.

We will present a system of automated drug application to a METI simulator using Aspects BIS Monitor and FM Controller by Braun.
In a hands-on part Participants will experience the various interactions and perform a real TCI controlled intravenous anesthesia with EEG-feedback.

Category of Simulation: Mannequin-based
Learning Objectives:
#1 Develop a curriculum for training Closed Loop Drug Application
#2 Discuss possibilities and limitations of Closed Loop Drug Application on a simulator
#3 Experiment a Closed Loop Drug Application device on a METI Simulator using EEG monitors and TCI systems.

Workshop # 1423

Presentation date/time: Sun 4:30-5:15 Spin

A Virtual Laparoscopic Simulator Used As Training Device For Beginners By Introducing A Novel Score System.

Joerg Beardi[1], Michael Schuetz[2], Patrick Hackman[2], Stefan Moenk[2], Wolfgang Heinrichs[2], Ines Gockel[3], Erol Gercek[1]
[1]Department of Trauma surgery, University Hospital of Mainz, Germany, [2]Department of Anaesthiology, University Hospital of Mainz, Germany, [3]Department of Abdominal Surgery, University Hospital of Mainz, Germany

Novices in laparoscopic surgery often suffer of a lack of training and experience in operating and even assisting laparoscopic operations. Despite of the interest in better operative quality, the chances of gaining more operative experience is rare. In the last years laparoscopic simulator training devices had been developed, which proved their ability to train skills of laparoscopic surgery. These task trainers are widely used in the research, e.g. if the simulator allows differentiation between surgeons with different laparoscopic experience. Therefore we developed a course for beginners in laparoscopic surgery with standardized training schedules, evaluation of the surgical skills before and after the training program and mediation of theoretical knowledge. The aim is to bring the novices rapidly up to a level comparable to second or third year intern. The schedule is divided in three blocks with different technical difficulty. At the beginning of each block the trainees are instructed by an experienced laparoscopic surgeon. In the following during 14 days, four basic laparoscopic tasks have to be done in three increasing levels of difficulty. Each task has to be performed 3 times which means that at the end of block one a total number of 36 operations have been performed by each trainee. In block two advanced laparoscopic skills are trained, also 4 tasks performed as described above. In the third block, the clipping and dissection procedure of the cyst duct and the cystic artery during cholecystectomy is performed. Each block must be finished after 14 days. Data is gained and evaluated and compared to a novel score system. This score system is developed on the basis of the results of experienced laparoscopic surgeons and focuses on the technical merit of the trainee. For the development of the score, 15 experienced laparoscopic surgeons operated the same tasks as described above. A composite performance level of all surgeons was build and for every evaluated criteria a total of 100 points was given. Tasks requiring more technical merit and which therefore are more suitable to distinguish between inexperienced and experienced surgeons weighted double of easier tasks. All points were added together and a total score was gained. If a minimum performance level is not reached by a trainee, he is reevaluated and again advised by the instructor. Using this program laparoscopic novices can easily gain experience and improve their surgical skills without affecting operative quality during their learning curve. In the workshop we will describe the target group, the schedules, the evaluation and the underlying score system. The tasks used will be shown on a virtual reality laparoscopy trainer. Each participant will operate two tasks of block 1 and two tasks of block 2. Results reached will be evaluated by the score system.

Category of Simulation: Virtual Reality
Learning Objectives:
#1 Learn how to educate with a virtual reality laparoscopic simulator
#2 Will be educated practically with tasks of the virtual reality laparoscopic simulator
#3 Will understand the evaluation using our score system

2006 IMMS Workshop Descriptions

Listed by Workshop Number

Workshop # 1427

Presentation date/time: Mon 3:45-4:30 Spin

Rating Surgeons' Behaviors in the Operating Room or OR Simulator.

Steven Yule[1], Rhona Flin[1], Simon Paterson- Brown[2], Nikki Maran[2], David Rowley[3]
[1]School of Psychology, University of Aberdeen, [2]Edinburgh Royal Infirmary, [3]Royal College of Surgeons of Edinburgh

Recent studies suggest that adverse events in surgery are more often caused by breakdowns in non-technical (CRM) skills, such as communication and team working, rather than failings in technical proficiency. One method to improve surgeons non-technical performance is to use observational methods to provide structured feedback on performance. Skills taxonomies and related behavioral marker systems are used to structure training and evaluation of non-technical skills in acute medicine as well as other high risk professions such as civil aviation and nuclear power. We have previously described the analytic techniques used to develop the NOTSS (Non-Technical Skills for Surgeons) skills taxonomy and behavior rating system which has been designed to provide a systematic and structured method of observing, rating, and providing feedback to surgeons on their CRM skills. This aim of this workshop is to allow participants to gain first hand experience of using a behavior rating system to evaluate the performance of surgeons in the operating room. Participants will be provided with a short training session on how to use the NOTSS system and then given the opportunity to rate the behaviors of a consultant surgeon in two different video scenarios. Participants will be asked to rate the skills they observe using a NOTSS rating form and to provide structured feedback to the surgeon in each scenarios which may improve future performance. We will then give participants the opportunity to compare their ratings, and discuss any difficulties they experienced with the task. Background materials will be available for participants to download at www.abdn.ac.uk/iprc/notss in advance of the workshop. Participants do not need prior experience of using observational techniques.

Category of Simulation: Mannequin-based
Learning Objectives:
#1 Learn about the NOTSS system for rating surgeons non-technical skills
#2 Rate videotapes filmed of simulated operations
#3 Discuss the ratings and the NOTSS system

Workshop # 1436

Presentation date/time: Sun 4:30 - 5:15 Naut 5

A Novel Birthing Simulator For Training In And Assessment Of Fetal Mechanical Response To Shoulder Dystocia Delivery Techniques.

Edith D. Gurewitsch[1], Tara Johnson[2], Stephanie Cha[2], Lindsay Kranker[2], Gillian Hoe[2], Robert H. Allen[2]
[1]Johns Hopkins University Department of Gynecology/Obstetrics, [2]Johns Hopkins University Department of Biomedical Engineering

Prevention or mitigation of neonatal injury following shoulder dystocia depends on proper execution of maneuvers and awareness of self-applied traction.

We present the design and implementation of our patent-pending, biofidelic mechanical simulator featuring instrumented maternal and fetal mannequins. The maternal model features a bony, rotatable pelvis, flexible legs, a birth canal, and an expulsing uterus, simulated soft tissue. The instrumented fetal model mimics head, neck, shoulder and arm movement. Adjustable clavicle width allows variation of shoulder dystocia severity. Sensors on the mannequins measure fetal head flexion, rotation and extension, clavicle and brachial plexus strain, and maternal pelvic rotation. Data are monitored in real-time via computer.

A separate force-sensing system utilizes electromyography and piezoresistive pressure sensors to assess clinician-applied force following calibration with a dynamometer. The simulator is a central feature of an educational program designed to reduce the risk of mechanical birth injury from shoulder dystocia.

2006 IMMS Workshop Descriptions

Listed by Workshop Number

Category of Simulation: Mannequin-based
Learning Objectives:
#1 Understand the advantages of a mechanical simulator specifically designed to capture the shoulder dystocia phenomenon
#2 Be able to practice shoulder dystocia maneuvers and assess the fetal mechanical response
#3 Be able to assess their own applied forces to the fetal head and correlate this with fetal mechanical response

Workshop # 1439

Presentation date/time: Mon 4:45 – 5:30 Spin

Innovation In Simulation for Field and EMS Training.

Les R. Becker[1,2], Angela L. Bennett[2], Donald C. Gerety[2], Amar P. Patel[2]
[1]EMS Performance Laboratory, Pacific Institute for Research & Evaluation, Calverton MD, [2]Advanced Life Support Program, Maryland Fire Rescue Institute, University of Maryland, College Park, MD

The goal of this workshop is to provide an opportunity for audience members to familiarize themselves and gain experience with applications of an untethered adult patient-simulator to prehospital training. Consisting of three coordinated activities, audience participants will: 1) Remotely direct an emergency care scenario via a radio-controlled, untethered, high-fidelity patient-simulator, while the user interface software and patient monitors are projected for all to see. 2) Observe, direct and/or participate in manikin-centered patient care scenarios developed to complement nationally recognized EMS prehospital training programs including Advanced Medical Life Support® and Prehospital Trauma Life Support®, as well as the U.S. Army's 91W curriculum; and 3) Observe, direct and/or participate in manikin-centered trauma care scenarios incorporating newly developed trauma simulation modules which realistically present different types of traumatic injuries with minimal set-up and break-down time. Experienced simulation facilitators will be present to support the efforts of audience members as needed.

Category of Simulation: Mannequin-based
Learning Objectives:
#1 Develop an understanding of the uses and capabilities of radio-controlled high-fidelity patient simulators.
#2 Understand the characteristics of manikin-centered patient care scenarios developed to complement national recognized EMS prehospital training programs.
#3 Develop an understanding of the uses of newly developed trauma simulation modules.

Workshop # 1443

Presentation date/time: Mon 3:45 – 4:30 Naut 5

Train Where You Work – Aspects Of Mobile "In-Situ" Simulation Training.

Marcus Rall[1], Eric Stricker[1], Silke Reddersen[1], Gerson Conrad[2], Peter Dieckmann[1]
[1]Center for Patient Safety and Simulation (TuPASS), Department of Anaesthesiology and Intensive Care Medicine, University Hospital Tuebingen, University of Tuebingen Medical School, Tuebingen, Germany, [2]German Air Rescue (DRF), Filderstadt, Germany

Participants of simulator based courses work in numerous medical disciplines like anaesthesiology, emergency or intensive care medicine, surgery and within different professions, like physicians, nurses or paramedics. Bringing simulation to their work place (termed "in-situ" training by D. Gaba) has many advantages (e.g. local environment) and disadvantages (e.g. logistics). During the workshop we will present our experiences in various locations (ambulance, OR, rescue helicopter, cath lab) including the audio-visual technical solutions for mobile simulator courses using video assisted debriefings. Small group discussions will explore the conceptual implications of mobile "in-situ" simulations. The workshop will be run by an interdisciplinary team of a work psychologist experienced in simulation training, a simulation center director and a user from the German Air Rescue.

2006 IMMS Workshop Descriptions

Listed by Workshop Number

Category of Simulation: Mannequin-based
Learning Objectives:
#1 Discuss the potentials and limits of "in-situ" simulation.
#2 Understand the technical requirements of mobile audio-video systems.
#3 Discuss conceptual implication for doing mobile "in-situ" simulation.

Workshop # 1452

Presentation date/time: Mon 2:45 – 3:30 SeaBr

Serious Games: The Oxymoron Problem.

Noah Falstein[1], Jeffrey Taekman[2]
[1]The Inspiracy, [2]Duke University Medical Center

A new generation of learners, brought up on interactive games, full-time connectivity, and rapid-fire multimedia, demand new ways of learning. A new educational paradigm, called Serious Games, combines state-of-the-art gaming technology with sound educational principles. Serious Games and 3-dimensional interactive environments represent the future of health-care simulation.

This workshop will be a round-table discussion exploring how serious games differ from traditional high-fidelity simulation, how games are revolutionizing military training, how games have been successfully deployed in non-medical fields, and how games will revolutionize health-care training.

We will attempt to identifying and strategize on how to overcome obstacles to the success of serious games in health-care.

Category of Simulation: Virtual Reality
Learning Objectives:
#1 Describe Serious Games.
#2 Compare and contrast traditional simulation and serious games.
#3 Describe unique challenges facing serious game developers in the healthcare space.

Workshop # 1456

Presentation date/time: Mon 4:45-5:30 HI 2

Interventional Vascular Simulation – The Use of Simulators in Interventional Cardiology Training and in Teaching of New Devices and Procedures.

Giora Weisz
Cardiovascular Research Foundation and Center for Interventional Vascular Therapy, Columbia University Medical Center, New York, NY

High-tech simulators, based on complex haptics technology integrated with interactive imaging software, have been recently introduced to the area of percutaneous vascular interventions. Developed initially to simulate coronary anatomy and to virtually perform angiography and angioplasty, the field has rapidly evolved into other fields of vascular interventions, including carotid stenting, peripheral vascular interventions, PFO closure and other emerging procedures.
The anatomy presented in the simulator has been electronically generated based on actual patients whose anatomies are characteristic of commonly encountered subsets; data from CT scans or MRI's are preprogrammed into a simulator, and vessels are reconstructed using that model. These reconstructions can be modified to adjust for certain anatomical variances (e.g., thrombus, tortuosity, or calcium).
Current simulator technology includes complications and adverse reactions as well as difficult anatomy to which the operator must respond. Simulators can be enabled for program-based response, as change in the vessel status (improvement, deterioration, or complication) or in response to hemodynamic parameters, similar to real-life events. Thus, successful simulation involves not only the technical procedural considerations, but also the cognitive aspects of identifying emergent scenarios and choosing the appropriate therapeutic response.

Interventional Vascular Simulation (IVS) allows the development and recording of certain metrics—measurements of response times, the choice of equipment, the choice of medication, negotiation of wires and catheters in blood vessels, and evaluation of elements involved in process of decision-making.
The use of simulation-based training is ideal for the education and practice of residents and fellows during their first steps in the interventional world. Experienced operators may also take advantage of this technology to train them in new concepts and technical aspects of new devices and procedures, and interventional treatment of new anatomical targets.
Interventional Vascular Simulation has been introduced and incorporated into the credentialing and certification area. For example, the current FDA approved carotid stent certification includes mandated simulated experience before approaching real patients.

IVS workshop: During the proposed workshop, the current status of IVS in interventional cardiology will be presented and discussed. All aspects of education, training, validation studies, certification, and accreditation will be presented. A simulator will be used to present the technology and an actual interventional case will be performed to demonstrate its usefulness as a training tool.

Category of Simulation: Virtual Reality
Learning Objectives:
#1 Learn about the current status of simulation in interventional cardiology
#2 Learn how simulators are being used for training vascular interventions

Workshop # 1465

Presentation date/time: Mon 2:45 – 3:30 Spin

Creation Of Structure-Function Relationships In The Design Of A Simulation Center.

Brian C Brost, Thomas E Belda, Kay M Thiemann, William F Dunn
Mayo Clinic Multidisciplinary Patient Simulation Center, Mayo Clinic College of Medicine

And you thought the hard part of starting a simulation center was getting approval... Now that you have been given a space of your own ranging from a large closet to an entire floor, the real fun begins.

Design of how to most effectively utilize this simulation space starts figuratively and literally at the drawing board. After defining the simulation needs that the space will serve, evaluation of structure-function relationships will allow optimal space utilization. Key factors in the development of this space includes design of the simulation area, control rooms and the observation/debrief rooms. Critical elements to the room layout includes the flow of learners through the simulation environment, separation of the learners from the actors/mannequins/task trainers until the simulation event, learner interaction in the simulation space and audiovisual recording of the simulation encounter.

Category of Simulation: Mannequin-based
Learning Objectives:
#1 Analyze factors in development of a simulation space
#2 Discuss elements involved in designing the control room
#3 Share components of the observation/debriefing location

2006 Poster Abstracts

Title and Presenting Author Listing

All authors and institutions are identified on individual abstracts

Marcus Rall, Chair S. Barry Issenberg, Co-Chair

Committee: Mark Adler, Haim Berkenstadt, David Gordon, Steven Howard, Gerry Moses, Emil Petrusa, Darral Brown, Gary Cole, John Faith, Mohamed Foraida, Roxane Gardner, Rose Hatala, Wolfgang Heinrichs, Elizabeth Hunt, Roger Kneebone, Richard Kyle, Vicki LeBlanc, William McGaghie, Sesh Mudumbai, Yaron Munz, Bosseau Murray, Harry Owen, Carla Pugh, Ross Scalese, March Shapiro, Elizabeth Sinz, Stephen Small, Jeffrey Taekman, John Vozenilek, Diane Wayne, Steven Yule, Amitai Ziv, Lenny Wade.

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2 **1379**	The Value Of Debriefing In Simulation-Based Education: Oral Versus Video-Assisted Feedback *Georges Savoldelli St. Michaelís Hospital Toronto Ontario Canada*
3 **1402**	Reflective Simulation: Enhancing The Studentí Learning Experiences Through Structure And Guidance *Indra Jones University Of Hertfordshire Hatfield HERTS United Kingdom*
4 **1404**	Efficacy Of A Human Patient Simulator To Improve Senior Residentsí Skills In Functioning As A Team Leader During Trauma Resuscitations *Elissa Schechter Yale New Haven Hospital New Haven CT*
5 **1421**	Real Patient Intensive Care Data On A Patient Simulator *Jochen Vollmer Simulationszentrum Mainz Mainz RLP Germany*
6 **1428**	Using Simulation For Nursing Competencies: Catching Problems In Training Courses *Leonard Wade Northwestern University Chicago IL*
7 **1444**	Becoming A Simulator Instructor And Learning To Facilitate: Evaluation Of The Instructor And Facilitation Training Ñ Infact *Peter Dieckmann Center For Patient Safety And Simulation Tuebingen Baden-W¸Rt Germany*
8 **1454**	After The Fact: Using Performance Data From A Standardized Patient Examination To Inform The Curriculum *Karen Szauter University Of Texas Medical Branch Galveston TX*
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19 **1500**	Introducing A Pilot OB/GYN Residency Simulation Program *David Linville East Tennessee State University Johnson City TN*
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21 **1504**	Use Of A High Fidelity Pediatric Patient Simulator To Train Transport Personnel *Scott Hagen University Of Wisconsin Children's Hospital Madison WI*
22 **1507**	The Use Of Blended Simulations In Medical Education *Diane Ferguson Uniformed Services University Bethesda MD*
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28 **1536**	Blending A Standardized Family Member With High-Fidelity Patient Simulation: An Integrated Approach To Teaching Breaking Bad News *Mary Rawn Uniformed Services University Bethesda MD*

29 **1538**	Simulation-Based Parent-Guided Project To Improve Disclosure Of Unanticipated Outcomes *Kimberly Yaeger Stanford University Palo Alto CA*
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43 D **1414**	An Innovative Method Of Transmitting Abnormal Auditory Findings For Medical Simulation In A Teaching Setting *Paul Lecat Akron General Medical Center Akron OH*
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85 **1395**	The Use Of A Cognitive Aid During Simulated Pediatric Cardiopulmonary Arrests-An Observation Of 60 Mock Codes *Kristen Nelson Johns Hopkins School Of Medicine Baltimore MD*
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94 **1520**	Letís See What Happened: Development of an Innovative Quad Screen Technology for a Comprehensive Recording of Interdisciplinary Team Training in a Virtual Operating Room Environment *Haim Berkenstadt LSU School Of Medicine, New Orleans LA*
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102 D **1460**	The Development Of A Role-Playing Simulation To Investigate Coordination Of An OR Master Schedule *Suzanne Weisband University Of Arizona Tucson AZ*
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D=Demonstration

All abstracts will be printed in Vol 1 Issue 2 of *Simulation in Healthcare: The Journal of the Society for Medical Simulation*

FULL ABSTRACTS are arranged numerically by the Abstract #.

Refer to the Abstract Listing Pages for the Abstract # that corresponds to the Poster Board #.

Abstracts are presented as they were submitted except for minor formatting.

Conflict of Interest statements located at the bottom of each abstract.

ABSTRACT # 1365
POSTER BOARD # 31

Trauma Simulation Drills in the Resuscitation unit: The Challenge of Improving the Performance of the Constantly Changing Trauma Teams.

Zmora Zohar[1], Igor Waksman[2], Shimon Ivry[3], Jack Stolero[1], Dvora Avital[1], Arieh Eitan[2]
Western Galillee Hospital Nahariya Israel
[1]Emergency medicine, [2]Surgery, [3]Anesthesia

Introduction
The initial management of the trauma victim is difficult and stressful, and can easily overwhelm the attending staff. Rapid and appropriate response is crucial for life saving and prevention of severe and long-term disabilities. The objective of the present study was to improve the individual and team performance of personnel in the trauma unit using simulation drills.

Methods
Before and after participating in at least two trauma simulation drills in the emergency department, participants completed a questionnaire appraising their performance in the resuscitation unit: familiarity with resuscitation activities such as intubation, chest tube insertion or central line insertion, and overall competence, as well as leadership and teamwork.
A senior surgeon and the trauma coordinator nurse in the trauma unit have conducted 40 trauma simulation drills over the last 4 years, using a simulation mannequin (SIM 4000, Laerdal). It allowed practice of airway management, including endotracheal intubation, insertion of IV lines, pelvic and limb fixation. External injuries were depicted by make-up. The common clinical scenarios included severe multiple trauma requiring urgent intervention and prioritizations: stab wounds, gun shot wounds, fall from height, pedestrian road accident, motorcycle accident and motor vehicle explosion. The trauma teams practiced simultaneous management of more than one severe trauma patient. Participants in the simulation drills included residents in surgery, orthopedics and anesthesia, and nurses assigned to the emergency department. The simulations were videotaped and were the basis of debriefing and conclusions immediately after the exercise.
Statistical workup was done using the Mann-Whitney and the Wilcoxon matched pairs tests.

Results
The pre-post response of 33 participants in such simulations indicated significant self-appraised improvement of skills following the simulation drills. Especially notable were improvement of drain insertion ($p=0.004$), fixation of cervical spine ($p=0.04$), management of complex trauma ($p=0.02$), and in overall ED performance ($p=0.01$). The effect was more pronounced for physicians than for nurses. All participants felt that the exercises contributed, at least partly, to their ED performance.

Conclusions
We believe that trauma simulation drills are the key for improving management of real trauma emergency resuscitation immediately upon patient arrival at the ED. These drills examine the level of knowledge, skills, and ability. They are performed in the environment familiar to the participating staff and entail scenarios of everyday trauma. These facts contribute to a serious and cooperative attitude of the participants, and make the drills efficient and advantageous. While it is difficult to estimate the actual contribution of the simulation trauma drills to the performance with real injured patients, our analysis of self-appraisal enabled us to focus on four topics which were significantly improved by these exercises, and to exclude other topics which needed no further improvement.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1371
POSTER BOARD # 1

A MULTI-INSTITUTIONAL PILOT STUDY TO EVALUATE THE USE OF VIRTUAL PATIENTS TO TEACH HEALTH PROFESSIONS STUDENTS HISTORY-TAKING AND COMMUNICATION SKILLS..

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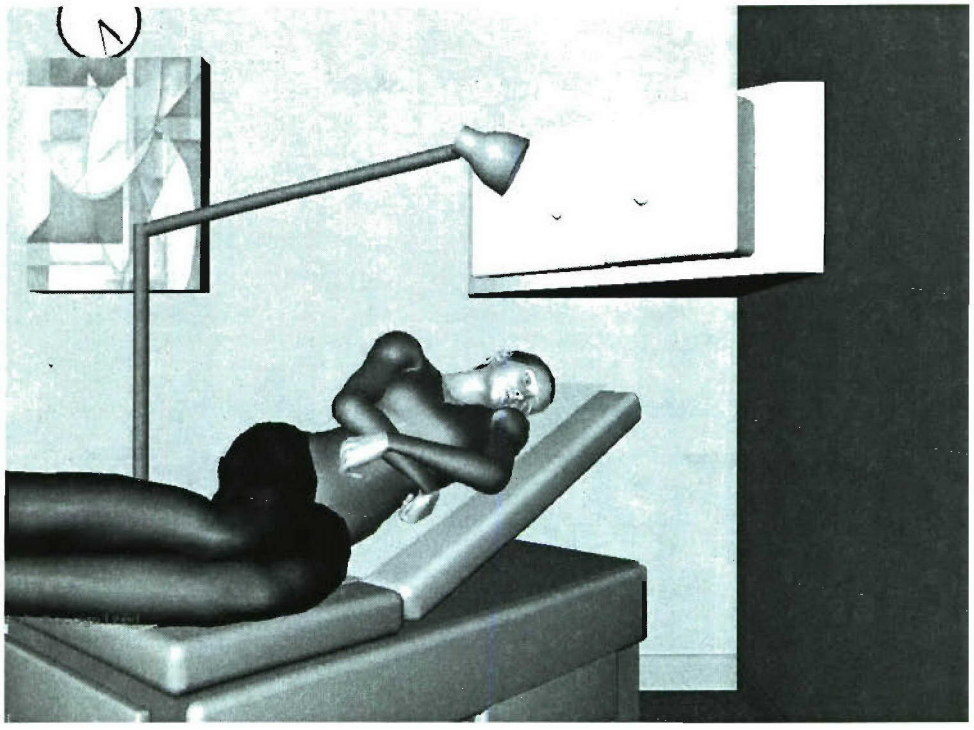
[1]Medical College of Georgia, [2]University of Florida

Background: At many institutions, health professions students learn communication skills through the use of standardized patients (SP), but SPs are time and resource expensive. Virtual patients (VP) may offer several advantages over SPs but little data exist regarding the use of VPs in teaching history–taking and communication skills. Medical educators and computer scientists have created an interactive virtual clinical scenario of a patient with acute abdominal pain. Preliminary studies from the University of Florida (UF) demonstrate that the virtual scenario may be useful in teaching health professions students history-taking and communication skills.
Objective: To assess the feasibility of implementing and evaluating this innovative virtual educational tool at a second institution, the Medical College of Georgia (MCG).
Methods: Medical and Physicians Assistant Students at UF (N=23) and MCG (N=31) volunteered to evaluate the virtual system. In the scenario, a life-sized VP is projected on the wall of an exam room in SP teaching and testing centers at MCG and UF (Figure 1). A virtual instructor (VI) provided the student with some background information and the goal of the virtual scenario and, after 10-minutes, he asked the student for their differential diagnosis. Students conversed with the VP via a commercially available speech recognition engine (Dragon Naturally Speaking Professional). Students were evaluated on their ability to: 1) ask the VP 12-core questions taken from an abdominal pain OSCE station checklist and, 2) to generate a differential diagnosis. In addition, immediately following the virtual scenario, students completed a validated SP questionnaire (Maastricht Simulated Patient Assessment) (Table 1). Data=Mean±SD. Data analyzed by Students t-test.
Conclusions: A virtual clinical scenario to teach health professions students history-taking and communication skills was successfully installed and evaluated at two institutions (MCG and UF). MCG students were more junior in their training and therefore had fewer SP interactions than the UF students. Despite students lower overall evaluation of VPs compared to SPs, there was no difference in students asking 12-core questions and generating a differential diagnosis between the groups. As technology matures, virtual clinical scenarios will provide students a controllable, secure, and safe learning environment with the opportunity for extensive repetitive practice with feedback without consequence to a real or SP.

Table 1 - Comparison of Virtual Patient (VP) and Standardized Patient (SP) Interactions

Survey Statement Response	UF-VP	MCG-VP	SP
Months in School	31.43±8.03*	18.76±8.76	
Previous SP Interactions	17.08±5.23*	6.00±4.74	
The VP/SP appears authentic.[1]	4.48±0.35	3.73±0.71	5.00±0.00
VP/SP stimulates the student to ask questions.[1]	4.13±0.99	3.00±1.10	3.12±1.64
I would use this tool to practice my clinical skills.[1]	4.78±1.06	3.81±0.88	4.87±0.35
Overall Evaluation. [2]	6.56±1.16	6.23±0.95	9.50±0.53**
Core Questions Checklist. [3]	7.04±1.10	6.42±1.33	6.75±1.03

[1] Five-point Likert-type scale (1=strongly disagree, 5=strongly agree), [2] Ten-point scale (1=lowest, 10=highest), [3] Twelve-item core questions, *$p<0.05$ versus MCG-VP, **$p<0.05$ versus UF-VP and MCG-VP



Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Grant support	University of Florida COMEC Grant

ABSTRACT # 1379
POSTER BOARD # 2

The Value of Debriefing in Simulation-based Education: Oral versus Video-assisted Feedback.

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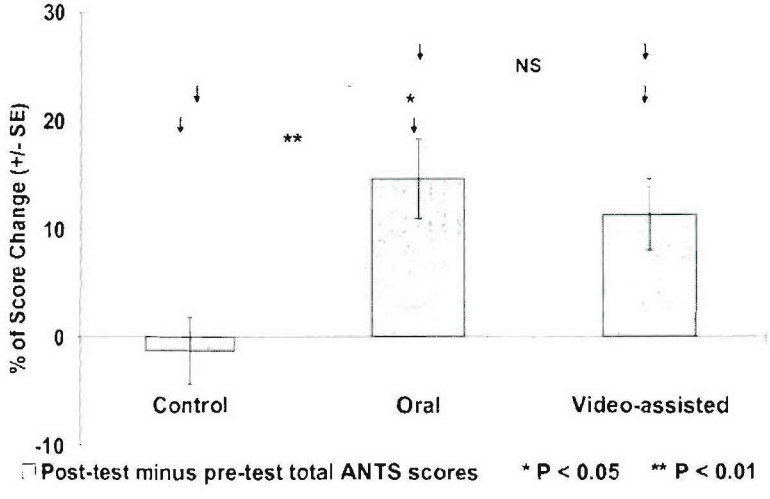
St. Michael's Anesthesia Research into Teaching (SMART) Simulation Group, Department of Anesthesia, St. Michael's Hospital and the Wilson Centre for Research in Education, University of Toronto, Toronto, Ontario, Canada

Background: The debriefing process during simulation-based education has been poorly studied despite its educational importance. Videotape feedback is an adjunct that may enhance the impact of debriefing and in turn aid in maximizing learning. The purpose of this study was to investigate the value of the debriefing process during simulation and to compare the educational effectiveness of two types of feedback: oral feedback without videotape review of the performance versus oral feedback with videotape review.

Methods: Forty-two anesthesia residents were pre-tested during a crisis scenario using a SimMan™ Simulator (Laerdal Medical Canada Ltd., Toronto, Ontario). Participants were randomly assigned to receive no debriefing (control), instructors' feedback (oral), or videotape-assisted instructors' feedback (video-assisted). The debriefing focused on non-technical skills guided by crisis resource management principles. Participants were then required to manage a post-test scenario. The videotapes of all performances were later reviewed by two blinded assessors who rated participants' non-technical skills using the ANTS scale, a validated scoring system (1). The mean changes in score were analyzed using ANOVA and Tukey's test for post-hoc comparisons.

Results: Participants' non-technical skills did not improve in the control group whereas the provision of verbal feedback, assisted or not with videotape review, resulted in significant improvement ($p<0.005$). There was no significant difference in score changes between the oral and video-assisted feedback groups (see Figure).



Conclusions: Mere exposure to a simulated crisis appears to offer little benefit to trainees. Constructive feedback on the initial performance provided by instructors is paramount and highly effective. The addition of video review did not offer any advantage over verbal feedback alone. Valuable simulation training can therefore be achieved even when video technology is not available.

1) Br J Anaesth 2003 ; 90 (5) : 580- 8.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1380
POSTER BOARD # 78

Clinical Simulation: Caring for a Critically Ill Patient with Sepsis.

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Purpose: The purpose of this simulation research was to assess whether experienced critical care nurses could better apply currently recommended therapeutic interventions for patients with sepsis by using a horizons trends clinical decision support tool, rather than just standard monitoring screen shots alone.
Methods: Simulation research participants (N=29) were first required to attend a didactic training session focusing on recognition and evidence-based treatment for critically ill patients with sepsis. Participants were then directed to apply these treatments in a simulated sepsis experience. Participants were brought into the simulation lab in a large booth at the National Teaching Institute Critical Care Nursing Conference, New Orleans, May 2005. A METI HPS (human patient simulator) was connected to a Philips Medical Systems Intellivue MP 90 and a Nellcor-Puritan-Bennett ventilator in a simulated critical care environment. Participants were given the patient history, and completed the rest of their assessment using the HPS and Intellivue patient monitoring. Data were collected to compare the use of bedside monitor displays with and without horizon screen trends in the care of patients with sepsis. Group 1 completed the sepsis scenario using a standard screen display, and group 2 had the addition of horizon trends on the display.
Results: Table 1 highlights the differences between the 2 groups. The point that marked the ***onset of sepsis*** was when each of the physiologic parameters met the current evidence-based screening criteria The mean time to get to every therapeutic decision point was shorter in Group 2 than in Group 1.
Conclusions: While the number of participants was too low to reach statistical significance, results of this pilot study support the hypothesis that the use of horizons screen trends assisted the clinicians in making more rapid clinical decisions.

Table 1: Group Comparisons for Initiation of Appropriate Sepsis Treatments

	Group 1 (N=13) with Screen Shots Only	Group 2 (N=16) with Horizons
Therapeutic endpoint:Time (in minutes) between onset of sepsis and initiation of:	Mean (SD)	Mean (SD)
fluid bolus	3.02 (1.6)	2.7 (1.5)
vasopressor	5.7 (1.6)	4.3 (1.2)
blood culture order	5.3 (.8)	4.7 (1.2)
antibiotic order	6.6 (.6)	5.5 (.5)

Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Employee	Philips Medical Systems (Giuliano and Johannessen)and METI (Leighton)

ABSTRACT # 1383
POSTER BOARD # 47

Non Technical Skills: The Effect of Experience in Anesthesia Trainees.

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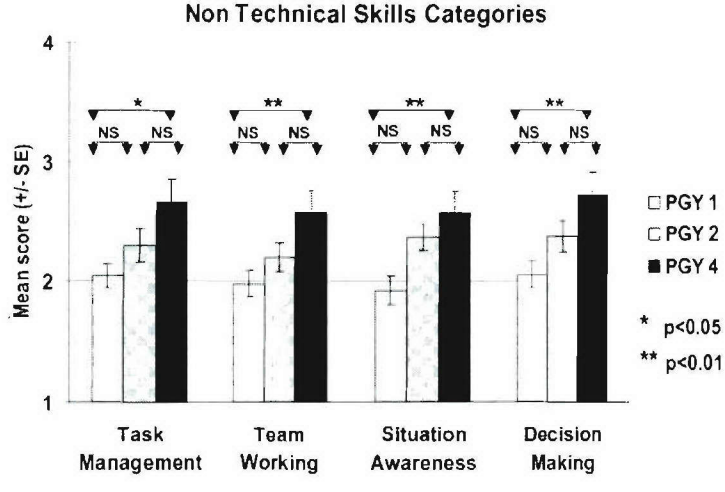
Background: Anaesthetists' Non Technical Skills (ANTS) encompass cognitive and behavioral skills such as task management, team working, situation awareness and decision making (1). It is believed that these qualities are acquired during residency by observing role models and therefore improve with experience. Simulation may also be the ideal setting to teach, reflect and practice these qualities (2). Objectifying these skills is therefore informative from an educational standpoint. This study investigated the effect of the level of training on the non technical skills of anesthesia residents.

Methods: The performances of 15 first year (PGY1), 15 second year (PGY2), and 12 fourth year anesthesia (PGY4) residents were videotaped during a crisis scenario using a SimMan™ Simulator (Laerdal Medical Canada Ltd., Toronto, Ontario). The tapes were later reviewed by two blinded assessors who rated participants' performances using a previously validated scale (ANTS scoring system) that assesses non technical skills (1). The mean total ANTS scores and the mean scores in each category of the scale were analyzed using ANOVA according to the level of training. Post-hoc comparisons were performed using Tukey's test.

Results: There was a significant overall difference among the three groups ($p<0.01$). Post-hoc analysis revealed that fourth-year residents' total ANTS scores were higher than first-year residents' scores ($p<0.01$), but did not differ from second-year residents ($p=0.21$). Scores between first and second-year residents did not differ ($p=0.22$). Mean ANTS scores at the categories level followed a similar pattern (see Figure).



Conclusions: Our results suggest that non technical skills of anesthesia residents increase with experience. However, the variability in performances was important within a given level of training; therefore, scores only significantly differ between very junior and senior residents. Formative evaluations using the ANTS system, either during simulation or during clinical practice, may prove useful to follow trainees' improvement and to provide them with constructive feedback.

1) Br J Anaesth 2003; 90 (5): 580-8.
2) Anesthesiology 2005; 103 (2): 241-8.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1387
POSTER BOARD # 74

The 2-year experience of new simulation-based airway management training protocol for junior physicians – Advanced Airway Life Support in Taiwan.

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Title: The 2-year experience of new simulation-based airway management training protocol for junior physicians – Advanced Airway Life Support in Taiwan

Authors: Pin-Tarng Chen, MD1, Ying-Che Huang, MD1, Huey-Wen Yien, MD PhD1, Cho-Yu Chan, MD2, Cheng-Deng Kuo, MD PhD3, Kwok-Han Chan, MD1.

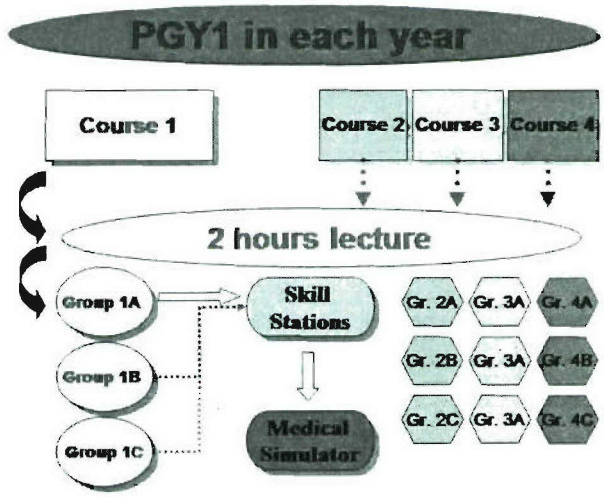
Institute: Department of Anesthesiology1, Clinical Skills Resources Center (CSRC)2, Department of Research and Education3, Taipei Veterans General Hospital

Aim of investigation: A new training and education post-graduate year 1 (PGY1) program for junior physicians was developed 2 years ago after Severe Acute Respiratory Syndrome (SARS) attack in Taiwan. Advanced Airway Life Support (AALS) is the airway management training protocol for PGY1. We report the current status of using skill workshops and medical simulator of AALS in our hospital.

Methods: The junior physicians in our hospital were all enrolled into the PGY1 course. They spent 3 months of the first year for PGY1 training. In each course, they must participate in the AALS. After 2 hours' lecture of general principle and introduction of instruments, they were divided into 3 groups for 4 hours' skill workshops and medical simulator training in Clinical Skills Resources Center at different times. In each group, they really practiced the skills at 10 stations of airway workshop. After that, the standardized human patient simulator (SimMan, Laederal) was operated to simulate the realistic clinical situations by using more than two programmed scenarios (according to the difficult airway management algorithm modified from ASA according to our hospital resources and ACLS guidelines). In each scenario, they must pass all performance check points. Video-based debriefing and feedback were made after each simulation. The questionnaire about AALS was collected 3 months after they finished PGY1 course.

Result: This AALS program has been developed for two years. Till now, 399 physicians had been trained with full protocols. The questionnaire revealed that the AALS training program was useful. They improved their spirit of leadership, techniques and ability of decision making, and they gained more confidence in resuscitation and airway management after participating in medical simulation.

Conclusions: Teaching airway management skills, especially for the difficult airway and protection of personnel, continues to be an important issue in Taiwan. The AALS training program provides methodical and systematic training. We speculate that the AALS is invaluable, especially for new beginner to grow to maturity with specialized technical skills and higher-order cognitive skills, behaviors and leadership in airway management. Furthermore, the results of using the medical simulator based training combined with AALS and ACLS for PGY1 airway management training are inspiring. This program will be continued and modified for other training systems.



Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1391
POSTER BOARD # 79

Management of Simulated Oxygen Supply Failure: Is There a Gap in Curriculum?.

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Background: The routine checking and maintenance of anesthesia equipment is a task that is increasingly being delegated to non-physician personnel. Subsequently, anesthesia trainees may not have exposure to this everyday practice. This could result in a diminished ability to manage an equipment-related crisis, which may compromise patient safety. High-fidelity patient simulation provides a safe environment to identify gaps in a trainee s knowledge and clinical performance. We conducted this study to evaluate the management of a simulated oxygen pipeline failure in our residency program.

Material and Methods: Twenty participants were videotaped while they managed an oxygen pipeline failure during a simulated carotid endarterectomy. The reserve O2 cylinder on the anesthesia gas machine was empty. If a new O2 cylinder was not requested by the subject, one was delivered, and the candidate was prompted to change the reserve O2 cylinder. At all times a self-inflating resuscitation (Ambu ®) bag was available to ventilate the patient's lungs. The videotapes were scored by two staff anesthesiologists using a performance checklist.

Results: 12 fourth-year (PGY4) and 8 second-year (PGY2) anesthesia residents participated in the study (Table 1). Fourth year residents did not perform significantly better than second year residents (all p=NS).

Conclusions: Our results suggest that the understanding and management of oxygen supply failure was deficient among relatively experienced residents at our institution. We suspect that the delegation of gas machine maintenance to perioperative personnel has created a new gap in knowledge. Our results also demonstrate that simulation-based programs that are integrated into the residency can identify gaps in trainee education, and provide useful feedback for responsive curriculum modification and improvement.

Proportion of Key Actions Performed			
Key Action	PGY2 (%) n=8	PGY4 (%) n=12	Total (%) n=20
Recognizes the O2 supply and pressure alarms	37.5	41.7	40.0
Opens the O2 cylinder on the machine	50.0	50.0	50.0
Recognizes that O2 cylinder is empty		37.5	50.0 45.0
Calls for a new O2 cylinder	50.0	66.7	60.0
Changes the O2 cylinder successfully	37.5	41.7	40.0
Ventilates patient with the Ambu bag	100	91.7	95.0
Anticipates patient awakening	37.5	41.7	40.0

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1392
POSTER BOARD # 89

Simulation Props: Enhancing Realism on a Budget.

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Suctioning Without the "Bloody" Mess

We developed a "dry" suction system, to add an element of realism while protecting the patient simulator from exposure to liquid damage. This system has a self feeding "blood" supply, and needs to be attached to an active suction source. Blood can be seen and heard being suctioned from the patient simulator, into a suction canister.

Material and Methods:
-Yankauer suction, suction tubing, 3-way stopcock, a pressure infuser bag, a suction source, a 500ml IV solution bag infused with red dye, IV tubing with a Luerlock adapter, stiff monitoring tubing with a Luerlock .

1) Make a short incision into the suction tubing approximately 3' from the end and attach the Yankauer catheter.
2) Attach the stopcock to the monitoring tubing and cut off the adapter on the other end. Lubricate the cut end and feed it through the incision of the suction tubing till you are about ½ inch from tip of Yankauer.
3) Take the 500ml IV bag with red dye. Attach IV tubing and place in the pressure infuser bag. Attach the IV tubing to the stopcock attached to the monitoring tubing.
4) Attach to suction and turn on. Apply pressure to the bag and open up the stopcock. "Blood" will flow to tip of the catheter fed from the monitoring line inside the suction tubing, and will then be suctioned back into the suction cannister.

Cuts and Bruises: Cheap and Easy

We developed these wounds to add an element of realism with the versatility of placing them anywhere on the simulator.

Material and Methods:
-Craft paints for painting on plastic or glass

1) Purchase a tube of clear (colorless) transparent paint, and squeeze some onto a small sheet of glass, plastic, or disposable palette the approximate size of a desired bruise or cut. Squeezing it out from the tube you will get a blob of white paint that will dry transparent and colorless. Gently tap or vibrate the surface to flatten out the blob. This will be your base onto which you paint the wound.
2) Allow 24 hours to dry.
3) Now use any brand of acrylic paints to create a wound onto the base. Paint your wound transparently (with thinned out paints), so when you place the wound, the simulator flesh color will show through in varying degrees. The transparency will create a natural blending making the wound more realistic.

Conclusion:

These designs were made at a low cost with minimal effort. They have enriched the realism of our simulations, and improved efficiency between scenarios.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1395
POSTER BOARD # 85

The Use of a Cognitive Aid During Simulated Pediatric Cardiopulmonary Arrests- An Observation of 60 Mock Codes.

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[1]Johns Hopkins School of Medicine, [2]Department of Anesthesia and Critical Care Medicine, [3]Department of Pediatrics

BACKGROUND: Morbidity and mortality associated with pediatric cardiopulmonary arrests is exceedingly high. Management of pediatric arrests is challenging due to the complexity of medication dosages related to variation in patient weights and lack of experience due to infrequency of events. Use of cognitive aids may assist in making rapid and accurate decisions in these critical situations; however, there are few reports on how these aids are utilized during arrest management and on whether they impact quality of care.

OBJECTIVE: 1.)Document the proportion of residents that possess and utilize cognitive aids during simulated cardiopulmonary arrests, i.e. "mock codes". 2.) Delineate the types of cognitive aids possessed and the manner in which they are used. 3.) Identify errors made during resuscitation efforts that may be related to the cognitive aid design.

METHODS: Observation, descriptive study. Sixty pediatric residents participated in individual mock codes with a high fidelity simulator, during annual competency assessments. each mock code included a standardized scenario that involved pulseless ventricular tachycardia and pulseless electrical activity (PEA), requiring the use of two separate algorithms based on American Heart Association (AHA) guidelines. The possession, utilization and type of cognitive aid used during these scenarios was documented.

RESULTS: 56/60 (93%) of pediatric residents possessed at least one cognitive aid, while 55/60 (92%) actually utilized the card. The types of aids possessed were: institutionally created card- 41/60 (68%), Pediatric Advanced Life Support (PALS) card issued by the AHA- 38/60% (63%), self-created card- 4/60 (7%) and 25/60 (42%) of residents possessed more than one aid. Of those who actually used a cognitive aid , 30/55 (55%) used an institutionally created card, 55% used a PALS card and 7/55 (13%) used more than one aid.
48/55 (87%) of residents used cognitive aids for assistance with algorithms, 5/55 (9%)used cognitive aids for medication dosage, and 2/56 (4%) used cognitive aids to determine ratio of chest compressions to ventilations needed.
Unfortunately, a tendency for residents to choose the wrong treatment algorithm while looking at the cognitive aids was noted. This appeared to be related to the layout of the cards. While using the AHA-PALS card, several residents chose the "tachycardia with poor perfusion" algorithm rather than the appropriate "pulseless ventricular tachycardia" algorithm. This resulted in the use of synchronized cardioversion instead of defibrillation and administration of epinephrine. Furthermore, there was a tendency of residents to use all cognitive aids to help them remember the underlying causes of PEA rather than starting chest compressions or asking for epinephrine, with an associated delay to initiation of Basic Life Support.

CONCLUSION: Mock codes reveal that a large proportion of pediatric residents possess and utilize cognitive aids during cardiopulmonary arrests. Unfortunately, recurrent patterns of errors and delays in appropriate therapy were noted. Further study is required to determine if errors are in fact associated with the layout of cognitive aids and whether improving the layout of cognitive aids can help minimize errors in Basic Life Support and ultimately improve patient outcomes.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1396
POSTER BOARD # 75

An investigation into the use of simulation and clinical skills training in the students' preparation for practice.

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Introduction

There is a recognition that many students are reaching qualification without ever becoming proficient in some basic competencies at both psychomotor and higher cognitive levels (Scott 2001). Students nowadays are increasingly expected to have acquired more and more technical skills by the time they qualify, however, there has been much concern about the ability of students to perform essential psychomotor skills, such as the monitoring of blood pressure and injection technique. In response to this, simulation and clinical skills centres are being developed across the country in order to change the way in which the teaching and learning of clinical skills takes place (Bradley & Postlewaite 2003).

Experiential learning through simulation and clinical skills is an essential component of nurse education in the United Kingdom (Alinier et al 2005). However, with the Widening Participation Agenda in Higher Education bringing an increasing number of students (DfES 2003), but comparatively less facilitation resources, it is becoming more and more difficult to allow all students to benefit from the same exposure of appropriate training. The overall aim of this project is to critically evaluate the perceived value of simulation and clinical training by students and provide some evidence on the basis of which simulation and clinical skills centres will be able to request additional staff and resources with ultimate increased benefits to both students and patients.

Method

Following ethical approval, a survey using structured and semi-structured questions to illuminate qualitative and quantitative data was designed and distributed to students on all years of the pre-registration nursing programme (n=1800) via the University's online managed learning environment (StudyNet). Upon return of the questionnaires, allowing a 2-month period for the students to reply, the data will be analysed using statistical and thematic analysis. A comparison will be made between students who have benefited from simulation training versus those who have only received clinical skills training in the classroom.

Conclusion

The results of this survey will provide both statistical and qualitative data from the students' perspective of their clinical training whilst at the University. This will provide an insight into the extent to which experiential learning through simulation and clinical skills training prepares them for practice. If judged beneficial by students, it could encourage the funding for superior simulation and skills training centres for experiential and hands-on training. This in turn could improve recruitment and attrition rates of nursing students (AimHigher 2004).

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Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1401
POSTER BOARD # 80

Title: Improving team communication at delivery among obstetric, anesthesia and neonatal team members using didactic instruction and on-site simulation-based training..

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Background: Crew Resource Management (CRM) training has been used in non-medical domains to enhance communication in situations where risk to life is high. In part based on these findings and other data in the literature, a subgroup of hospitals in the Vermont Oxford Network (VON), a national collaborative of hospitals dedicated to evidence-based quality improvement in neonatology, embarked on a project to improve communication in the delivery room.

Methods: Six tertiary obstetric and neonatal intensive care units* are in the first year of this two-year project to improve communication among obstetric, anesthesia and neonatal team members. Each site has applied for and received authorization from its Institutional Review Board to conduct this project and enroll human subjects. Baseline performance at each site is being assessed by:
1) staff survey (3-point Likert scale) designed to evaluate knowledge of CRM behaviors, and
2) team communication scoring tool developed specifically for the delivery room.
CRM skills are then introduced with a didactic presentation followed by real-time, simulation-based training conducted in the labor and delivery units of each hospital using commercially available technologies. Scenarios emphasizing CRM strategies such as SBAR (situation, background, assessment, recommendation), repeat-backs and transparent thinking have been developed and refined at each site. Self-selected leaders have received training in communication and serve as the primary debriefing and assessment teams.

Follow-up data will be obtained in the second year of the project. Staff surveys will be re-issued after didactic training is complete and again after simulation-based training is compete. The team communication scoring tool will be used to assess communication in both simulated and real deliveries. Results pre- and post-training will be compared to assess the effect of simulation-based training on performance during real deliveries.

Results: The members of this collaborative have accomplished a number of important tasks as they near the end of the first year of this project. They have developed and refined two assessment tools (staff survey, team communication scoring tool), designed a number of training scenarios, standardized the content and equipment used in these scenarios across six sites, trained leaders at each site in debriefing and scoring team performance, and have begun assessing baseline content knowledge and communication in the real delivery room. Over 500 staff surveys have been returned thus far and real delivery room performance is being scored on a daily basis.

Conclusions: Implementation of simulation-based training can be accomplished using current technologies in the actual clinical environments at centers lacking dedicated simulation facilities. By first identifying focused learning objectives, then developing pertinent assessment tools and practical implementation strategies, it is possible to carry out simulation-based training in the "real world" that has the potential to improve staff performance, institutional safety culture, and ultimately patient care.

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Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1402
POSTER BOARD # 3

Reflective Simulation: Enhancing the student' learning experiences through structure and guidance.

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Introduction

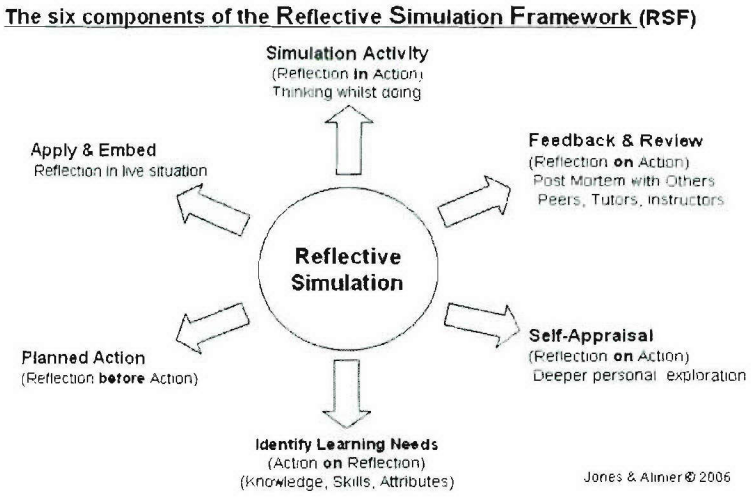
Reflective practice in nursing, medicine and allied health care disciplines is now commonly recognised in UK professional benchmark statements and seen as a desirable outcome for both clinical practice and continuing professional development (CPD). Described as process through which students can purposefully revisit, analyse, evaluate and learn from experiences, the Reflective Simulation Framework (RSF)[1] is designed to structure and guide the students' experiences in ways that foster deep learning about critical incident management. The underlying pedagogies are grounded in the works of Dewey[2] and Kolb[3].

The Reflective Simulation Framework

The (RSF) which comprises six dimensions is an iterative learner centred model which can be used flexibly to explore the simulated experience in order to enhance learning and practice and crucially act as a basis for multiple feedback systems

Discussion

Currently, there is a lack of structured guidance in the field Simulation learning to promote reflective practice[4,5]. This is especially the case before students attend simulation activities. As the use of simulation based learning has increased considerably, a real need has been identified to provide students and instructors with a more concrete approach to engaging with reflective learning.



We propose that unlike other approaches to learning the RSF can be used as an advanced organiser to help accelerate the learning process not just after the event but prior to and during simulation experiences. We believe that the RSF model should be handed out to students alongside other introductory materials as part of the overall orientation to simulation.

The definitions, features and use of RSF when combined present a creative and flexible approach to reflective simulation learning and teaching in structured and guided ways. The visual representation of reflective processes promotes reflection as a conscious formal activity with purposeful outcomes for personal development and enhanced professional practice.

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Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1404
POSTER BOARD # 4

Efficacy of a Human Patient Simulator to Improve Senior Residents' skills in Functioning as a Team Leader During Trauma Resuscitations.

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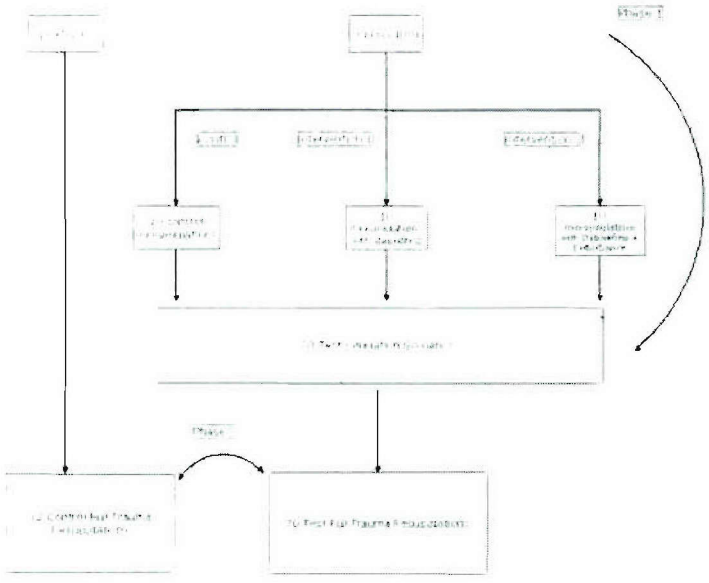
Effective communication and leadership skills are vital in leaders of trauma resuscitations. These aspects of physician behavior are seldom taught during medical education. Use of human patient simulators to create trauma situations "on demand" and without risk to patients may facilitate acquisition of these skills. To date there are no studies that examine which aspects of simulation exercises are responsible for improvement in physician performance on subsequent simulations. Additionally, though there is some evidence that procedural skills learned in a simulation environment can translate into real life procedural improvement, it has not been convincingly demonstrated that skills related to team leadership acquired during a simulation exercise can be reliably transferred to real trauma situations.

We have designed a two phase study to address these issues. In phase 1, to examine which aspects of simulation exercises are required for learning, 30 senior emergency medicine (EM) and general surgery (GS) residents will be randomized into a control and 2 intervention groups, each of which will be exposed to two simulation scenarios that are identical in terms of traumatic injuries. The members of intervention group 1 will also be exposed to a debriefing session that will focus on the crisis resource management effort of the team leader, specifically encouraging reflection on the traits required of the trauma team leader. Intervention group 2 will be exposed to the same trauma scenarios and debriefing session, but with the addition of a "disturbance" to each scenario that is designed to challenge the ability of the team leader to function in his/her required role. After participation in these 2 scenarios, each study subject will undergo a videotaped test trauma simulation. Outcome measures will be twofold. The first will be in the form of a leadership evaluation rating form, filled out by independent EM and GS faculty members who are blinded to the subject's study group. The second will be a self-efficacy instrument designed to assess levels of self confidence in leadership capabilities. It is hypothesized that it is necessary to provide a debriefing session as well as a simulation scenario that specifically targets leadership in order to see improvement in the leadership domain.

The purpose of phase 2 of this study will be to compare the 30 residents who underwent training on the trauma simulator with 12 historical controls who have not been exposed to the simulation scenarios, and evaluate (with the same assessment tools previously described) each group's performance as team leader in real full trauma resuscitations.



Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1409
POSTER BOARD # 64

Medical Decision Making Under Stress- Evaluating the Impact of Medical Simulation Instruction on Affective Learning

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PURPOSE: In an emergency, cognitive ability, performance, and decision making skills of personnel are often impaired due to physical and psychological effects of stress. Previous research has demonstrated the potential of simulation to improve cognitive and psychomotor outcomes, while little attention focused on affective learning domains and performance. The goal of this research was to use patient simulation in combination with stress inoculation training to decrease the physiological and psychological effects of stress experienced by participants and thereby diminish its effects on decision making and skill degradation and improve overall medical performance to a simulated anesthesia emergency.

METHODS: We assessed the impact of psychological and physiological stress upon performance of senior SRNAs during a series simulated emergencies. Psychological measurements included the State-Trait Anxiety Inventory and two Likert-scale responses to the subject's perceived levels of stress and self-confidence. Physiological measures included heart rate, blood pressure, and salivary cortisol level. Performance was judged by a 3 CRNA panel using a standardized 100 point score sheet. Because of the individual variation in response to stress, each subject served as their own control. Each subject participated in a pre- and post- intervention simulation scenario four weeks apart. Each subject received 12 hours of simulation-based instruction in the management of anesthesia related emergencies and in the theory and application of stress inoculation training.

FINDINGS: The average age of the subject group (N = 54) was 39.2 years, gender ratio was 60% female to 40% males, with an average of 12.6 years of nursing experience. All measures showed significant increases above resting baselines obtained before the simulation scenarios. In comparisons during the pre- and post-intervention scenarios, physiologic measures showed a significant decrease: heart rate ($p \leq 0.001$), systolic blood pressure ($p \leq 0.001$), and salivary cortisol level ($p \leq 0.001$). State anxiety scores decreased an average of 10.6 points ($p \leq 0.001$) while trait anxiety remained unchanged ($p = 0.098$). Perceived stress going into both scenarios was not significantly different ($p = 0.175$). However, their perceived level of stress during the post-intervention scenario declined significantly ($p = 0.0007$). Self-confidence was significantly higher going in to the post intervention scenario ($p \leq 0.001$). Likewise, self-confidence during the post-intervention scenario was significantly higher ($p = 0.0023$). Performance ratings significantly improved between the pre- and post-intervention measures ($p \leq 0.001$).

DISCUSSION: This study documents the stress load that patient simulation is capable of replicating through cognitive, psychomotor, and affective requirements placed on medical personnel in a simulated emergency. While subjects reported a high level of perceived stress even during our post-intervention assessment, validating the realism of the simulation, their confidence and their performance ratings were high. Our study was able to demonstrate an improvement in medical performance following simulation-based instruction in the management of anesthesia related emergencies and the application of stress inoculation training. This study affirms the utility of simulation-based instruction in mitigating the physical and psychological effects of stress, created by the emergency event itself which otherwise may impair thought process, performance, and decision making abilities of medical personnel.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1414
POSTER BOARD # 43

An Innovative Method Of Transmitting Abnormal Auditory Findings For Medical Simulation In A Teaching Setting.

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Introduction: A limitation of using standardized patients in training medical students and residents to detect sound abnormalities is the inability to demonstrate realistic abnormal findings. We describe an inexpensive, yet adequate method of broadcasting abnormal auditory findings to a conventional stethoscope with only slight modification.

Method: A wireless FM radio transmitter sends medically-appropriate teaching sounds to a training stethoscope (a conventional stethoscope wired with an FM receiver). Medical trainees are able to carry out normal physical exam of patients under the close observation of practicing medical personnel. Faculty may select clinically normal or abnormal sounds which are pulmonary, cardiac, abdominal, and/or vascular in nature. The pre-selected sound(s) are sent from the transmitter to the receiver in undetected fashion such that they appear to be originating from the point of contact with the stethoscope head.

Results: The range of this device is approximately six to twelve feet which allows this device to be implemented in a patient-physician training setting with or without the presence of the supervising physician in the same room. Additionally, using several properly modified stethoscopes, this device may be adapted for use in small group teaching scenarios and/or when using patient simulators.

Conclusions: In an age when time and cost restrictions result in fewer opportunities to observe the basics of medicine, medical simulation comes to the forefront. This auditory medical simulation device provides the benefit of meeting the time and cost restrictions of medical training, as well as the opportunity for a controlled teaching environment with respect to clinical auditory findings.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1415
POSTER BOARD # 100

Identification of Human Factors Elucidated during Obstetrical Team Training using High-Fidelity Simulation.

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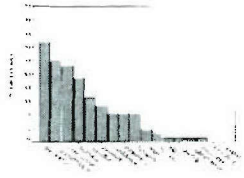
INTRODUCTION

The issue of patient safety is at the forefront of both public and medical discussions. This study involves the development of a multidisciplinary program using realistic high-fidelity simulation that promotes patient safety in parturients.



METHODS

After REB approval, 6 obstetricians, 3 obstetrics residents, 6 anesthesiologists, 3 anesthesia residents and 15 obstetric nurses were invited to participate. Teams managed 4 high-fidelity obstetrical emergency scenarios: 1) urgent Caesarean section (C/S), difficult airway; 2) urgent C/S, severe preeclampsia; 3) twin gestation, cord prolapse; 4) emergent C/S, abruption, massive blood loss. Participants were asked to complete a questionnaire regarding the realism and usefulness of the session and as well to identify important human factors that contributed to the teams' performances in either a negative or positive way.

RESULTS

Thirty-four physicians and nurses participated in the study. Their opinions of the simulation scenarios are represented in Table 1. There was no statistically significant difference in opinions between RNs and MDs except the item concerning the feeling of intimidation in the setting. Figure 1 identifies the participants' opinions of what human factors were most important to how the teams performed during the obstetrical crises.

DISCUSSION

The use of simulation is a valuable teaching tool for obstetric teams and scenarios were felt to be realistic and relevant to clinical practice. Important human factors items were identified by participants and can be used to guide future education and evaluation of teams using high-fidelity simulation.

Scenario Opinions Mean ± SD (1=strongly disagree, 5=strongly agree)			
Questions	All (n=34)	RNs (n=16)	MDs (n=18)
The scenarios were realistic	3.91± 0.97	4.00 ± 1.03	3.83 ±0.92
The scenarios represented a real situation	4.15±0.99	4.25±1.00	4.06±1.00
The scenarios were important ones to rehearse	4.62±0.89	4.88±0.34	4.39±1.14
I felt intimidated in this setting	3.00±1.41	3.63*±1.36	2.44*±1.25
I felt that practicing these scenarios will improve clinical performance	4.09±1.22	4.06±1.24	4.11±1.23
Knowing I was being evaluated affected my performance	2.82±1.53	3.19±1.72	2.50±1.29
*p=0.028			

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1418
POSTER BOARD # 101

Surgical Simulation in Congenital Heart Disease.

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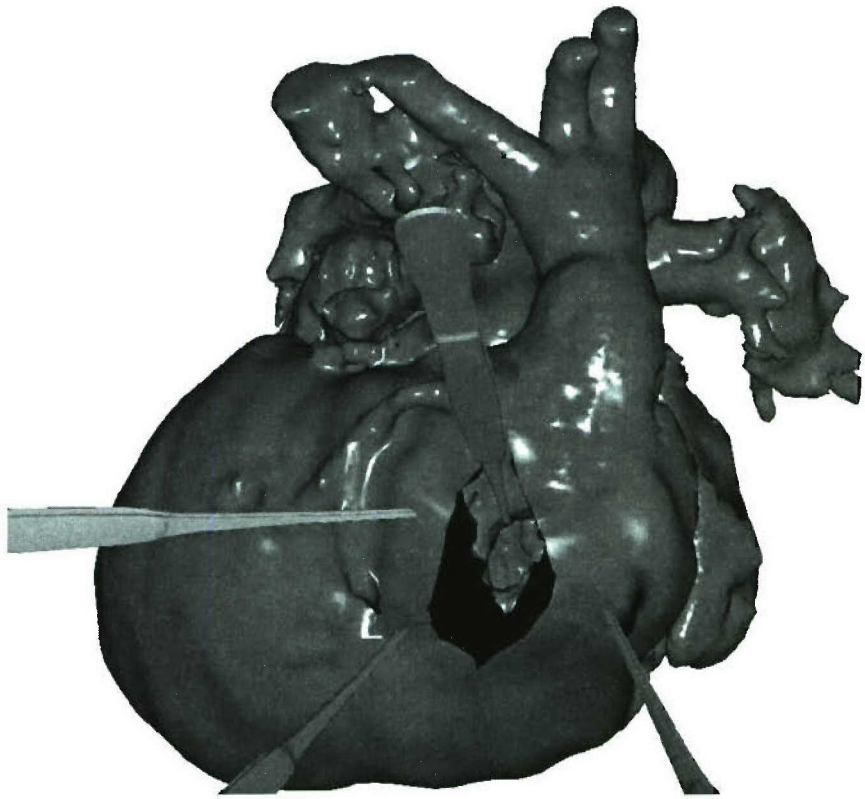
This abstract summarises our ongoing technical and clinical research to simulate surgical procedures on congenital heart defects. Patient-specific simulation of congenital heart defects is a very challenging project including data acquisition, segmentation, visualization and simulation. The relatively small scale and the rapid beating of a child's heart makes acquisition of data difficult. The virtual hearts in our simulator are reconstructed based on patient-specific MRI [1,2]. A simulation of tissue deformation controls the elastic behaviour of the heart in response to interaction. This is challenging since the complex morphology of the heart demands a high degree of detail and consequently a very fast calculation of tissue-deformation. An implementation on the Graphics Processing Unit (GPU) achieved a performance increase of up to 30 times [3,4] allowing simulation of very complex morphology. To provide even more visualisation detail, we have introduced a real-time mapping from the GPU-based simulation to the deformation of an arbitrarily detailed surface mesh [7]. The surgeon interacts with the virtual heart through haptic devices representing virtual instruments. Our current simulator prototype allows tissue deformation through grabbing or probing as well as incisions. To make haptic-feedback possible in combination with the GPU-based simulation we had to carefully design the GPU to CPU communication model to avoid bottlenecks [8]. Based on the successful implementation of the simulator prototype, we determined optimal incision points preoperatively in two clinical cases [5,6].



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Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1419
POSTER BOARD # 92

Cochlear Implant Insertion: A Virtual Approach for Medical Education.

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Cochlear implantation is a maximally invasive yet delicate surgical procedure that involves placement of a tiny electrode array deep inside the inner ear, in order to electrically excite the auditory nerve and provide the sensation of sound to the recipient. Surgeons must undertake years of specialized training to develop the skill required to perform such an operation. In this work, a surgical simulator has been produced to supplement current methods of otologist training. The surgeon is able to perform real-time cochlear implant insertion into a three-dimensional model of the human Scala Tympani (ST). Visual and force-feedback are relayed to the user throughout the insertion. The haptic representation is based on physical data. Force profiles from the simulation are compared with those produced experimentally, in order to validate the model.

The literature presents the overall project, including the visual and haptic responses of the system. Haptic modeling is the primary focus of the work and includes optimization approaches for simplification of the ST polygonal surface representation, as well as sub-sampling the electrode carrier to enable real-time haptic responses. Physical properties of the ST and carrier, such as the accumulation of force due to friction, are included in the model. Results for comparison of experimental and simulated data are presented. During the insertion process, force, torque and position data is logged. This information is used to compare the results produced from the simulation with data that has been experimentally determined. Insertion experiments were performed using an Instron (Instron Pty Ltd.) force measurement device to advance a Nucleus® 24 ContourTM electrode array into a synthetic model of the human ST. A statistical analysis is currently underway, to compare the results produced experimentally with those from the simulation. However, preliminary comparisons reveal significant similarities between force profiles. Final simulator characteristics are discussed in the work.

This system is the first of its kind to offer real-time visual and haptic feedback during insertion of a cochlear implant into an anatomically accurate model of the human ST. It will enable surgeons to practice the procedure pre-operatively in a safe, reproducible and cost-effective environment. It also demonstrates potential for application to other medical techniques, including laparoscopies, biopsies or alternative device implantations.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1421
POSTER BOARD # 5

Real Patient Intensive Care Data On A Patient Simulator.

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Introduction:
Simulation of the course of disease of critically ill patients is a difficult but desirable task for the training of medical professionals.
The usage of existing model-driven patient simulators in this field can be questioned as their educational models are based on "healthy" patient's physiology and typical problems of intensive care patients (e.g. development of multi organ failures) cannot be simulated very well.
To a big part this is due to a lack of mathematical models that describe the pathophysiological processes in critically ill patients and obtaining mathematical sound models for such patients will probably not be possible in the near future.
How can we approach simulation of intensive care patients using the available tools?
The first step could be educational reproduction of a real patient's course of disease.

Methods:
Based on data from a patient data management system of about 3000 intensive care patients with 15000 total days of treatment we developed a method to automatically transfer the course of a real patient's diseases into scenarios on a METI Human Patient Simulator.
The baseline data codes bedside information about the patient and his disease, a record of the status of the patient during his stay in the intensive care unit dissected into the performance of individual organ systems on a 24h basis. The performance of each of these organ systems was qualified in one of 5 discrete classes from "fully functional" to "highly critical". Additionally a tendency of the development of the status in each of the organ systems was recorded on a daily basis.
Using METI HPS version 6.3 as a physiology simulator, we identified the parameters inside the HPS software that describe function and performance of each of the recorded organ systems. We calibrated the values for each of these parameter sets to the levels of the discrete classes that described the organ status. The tendency of the developments in each of the organ systems was then translated into an onset-speed of the change of each of the parameters for the organ system.
The data of each of the recorded days of a patient's stay in the ICU was coded into a state in a METI HPS scenario.

Results:
The translation of real ICU patient data into METI HPS patients and scenarios generates patient models which - within the limits of educational models - represent the underlying real patient. It enables us to look at the course of a disease in real time as well as in just a few minutes. This allows to discover general tendencies and correlations of different states in the disease. With this method we obtain a possibility to reproduce critically ill patients for demonstration and training purposes.

Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Board Member/Consultant/Advisor	Medical Education Technologies Inc. Vollmer, Mönk, Heinrichs

ABSTRACT # 1425
POSTER BOARD # 32

"Clinical Concepts": A Method For The Easy Creation Of Patients On A Full Scale Simulator.

Stefan Moenk[1,2], Jochen Vollmer[2], Michael Schütz[1], Benjamin Kos[1], Wolfgang Heinrichs[1,2]
[1]Simulation Center, Mainz University , Germany, [2]AQAI GmbH Simulation, Mainz, Germany

Background

Model-driven, mannequin based simulators with models of physiology allow the creation of realistic patients for educational purposes. The resulting scenarios are potentially realistic and may require less instructor interference than scenarios without models of physiology. Realistic simulator reactions are important for the "suspense of disbelief". Disadvantage of this approach is the requirement to learn the complex models. Also, some facilitators wish to use the models in a way that is more conform with their clinical thinking: They employ mental concepts instead of physiological values to describe a state. E.g. instead of "increased intravascular volume, heart rate, respiratory rate, oxygen consumption with decreased functional residual capacity etc." one could speak of pregnancy. We describe a method that allows the implementation of clinical concepts into physiological modelling.

Method

We based our work on the Human Patient Simulator (HPS, METI, Sarasota) version 6.3. For selected physiological states we collected from the literature a detailed list of physiological changes. For physiologic conditions that can be further classified (e.g. acute or chronic hypertension) we described each state. In a next step we created a list of model variables and computations to generate HPS values from the collected data. The result is a matrix with literature data as input and simulator variables and computations as output.

Result

We have generated data sets for 2 different physiological conditions: Pregnancy and hypertensive disease. We generated a software programme which allows the easy selection of physiological states which are transferred into the HPS. E.g. in the case of pregnancy it allows the selection and combination of the trimester and of complications such as eclampsia. With very few user inputs, complex clinical cases can be generated based on the concepts used by clinicians. The system allows the combination of full scale model driven simulation with a simple user interface for complex cases and supports the mental concepts that are shared by clinicians.

Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Board Member/Consultant/Advisor	METI Ltd., Sarasota

ABSTRACT # 1428
POSTER BOARD # 6

Using Simulation for Nursing Competencies: Catching Problems in Training Courses.

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Introduction

In the last few years, our institution has been utilizing our Simulation Center to evaluate nursing competencies. It has become an increasingly popular evaluation tool for nursing administrators in charge of training. We recently discovered how using our simulation lab for competency evaluations revealed a possible problem area for one of our nursing training courses.

Materials and Methods

A total of 36 ICU nurses were divided into 13 groups, with most groups comprised of 3 nurses. Using the HPS-6 model Human Patient Simulator (Medical Education Technologies, Inc. Sarasota, FL), each group took part in the same case scenario. The scenario was a complex one, designed in a way that the nurses would have to demonstrate their ability to perform many important ICU tasks. The tasks included demonstrating skills in: airway management, ABG interpretation, IABP waveform analysis, femoral artery sheath removal, Propofol dosing, using various defibrillator modes during a cardiac arrest, PA catheter waveform analysis, hemodynamic data interpretatation, extubation procedures, transvenous pacing and checking blood products for administration. The ICU nurse trainer ran each scenario and utilized the instant feedback method to correct mistakes, thereby incorporating teaching into the scenario as well as evaluation.

Results

A wide variety of mistakes were made throughout the course of the evaluations. However, of all the specific competency tasks that were built into the scenario, the one with the most interesting finding was the *checking blood products for administration* task. An alarming number of groups made the same potentially serious error when checking blood products: they were checking the blood requisition donor pool number against its own carbon copy rather than against the bar code/donor pool label on the blood product. Unfortunately, we did not record the exact number of groups that made this error, however, both the ICU trainer and the simulator operator estimated that 10 of the 13 groups (76%) made that mistake.

Discussion

What makes this finding so interesting, is that as part of our hospital's ongoing quality control program, the entire nursing department had recently completed an educational initiative on this very task - the approved protocol for the proper checking and administration of blood products. It became more and more apparent as each of our sessions concluded, that this particular part of the checking procedure was not stressed during the hospital-wide training. As a result of our observations in the simulation lab, all of the ICU nurses in the unit utilizing this scenario have had additional training in checking blood products for administration. The ICU trainer is currently in the process of collaborating with the hospital to ensure that future hospital-wide training on checking blood products stresses the importance of checking the blood requisition against the blood product label and not the carbon copy. We feel that this exemplifies how using simulation as part of the nursing competency testing process can not only be extremely beneficial for evaluating nursing skills, it can also be used to help identify specific problem areas in training courses.

Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Board Member/Consultant/Advisor	Medical Education Technologies, Inc.

ABSTRACT # 1429
POSTER BOARD # 76

The Magnetic Resonance Imaging Story: Assessing time to clinical competency and the future implementation of simulation.

Lorraine Ramsay, Michelle Mummery, Kathryn Parker, Karim S Bandali
The Michener Institute for Applied Health Sciences

The present clinical education model for allied health programs is fully dependent on the number of available clinical placements. A decrease in the number of available placements and the high cost of clinical education are presenting significant challenges to educational programs. Decreased available clinical spaces leads to a decreased number of applicants accepted into a program. The implications for future human resources and the effect on patient wait-times for diagnostic tests such as Magnetic Resonance Imaging (MRI) are immense. In response to these issues, The Michener Institute for Applied Health Sciences conducted a retrospective analysis in our MRI program to determine at which point during the students' 12 week clinical rotation they were assessed as competent. It was found that a majority of students, 55%, reach competency by week 11, while a further 36% demonstrated competency by week 12, and 9% required more than the 12 weeks.

These findings led to further inquiry into possible ways in which to deliver clinical education to each of these three groups of students to enhance their learning experience and assess the time to reach competency. The introduction of simulation activities into the curriculum prior to the clinical rotation is proposed to aid in reducing the length of the rotation, in improving the efficiency of time spent in the clinical site and provide remediation to those students in need of additional clinical experience. To investigate the impact of a simulated-enhanced curriculum on clinical education, a current funded project will allow for the introduction of two levels of simulation in the program's didactic phase.

The first is the implementation of unique, individual software-based simulators for protocol manipulation. The second is the installation of an MRI sham unit, an exact replica of a fully functional MR system without the need for a full and expensive magnet set-up. The first student cohort to experience the simulation-enhanced curriculum (SEC) will complete the program in the fall of 2006. Time to clinical competency for the SEC cohort will be calculated and compared to the previous cohort. In addition, semi-structured interviews with SEC students and their clinical educators will investigate the value of the SEC curriculum and its impact on the quality of the clinical experience. It is anticipated that the implementation of the SEC will better prepare students, lead to the reduction in clinical time thereby potentially contributing to decreased wait times, timely access to diagnostic tests and reduced workload of technologists and clinicians, ultimately benefiting patient care.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1432
POSTER BOARD # 86

A Comparative Study Of Coordination Processes Related To Different Levels Of Performance During A Simulated Anesthetic Crisis.

Tanja Manser, T. Kyle Harrison, Steven K. Howard, David M. Gaba
VA Palo Alto Health Care System

Background and Goal
Incident analyses show that many critical situations in health care correspond to difficulties in teamwork or more specifically in communication and coordination. In anesthesia, one of the most complex and dynamic work settings within the hospital, the structure and process of crew coordination related to high performance during crisis situations have not yet been investigated. In other domains high performing crews have been described to adapt their coordination processes to the situational requirements. A pilot study was conducted to describe coordination processes related to different levels of performance during a simulated anesthetic crisis.
Materials and methods
The coordination process of 24 anesthesia crews during simulated MH scenarios (ACRM1 courses) was recorded using a predefined set of observation categories (Manser et al., 2005). The relative frequencies of the various coordination activities were correlated with technical performance scores for the treatment of MH (Harrison et al., 2004). The quantitative analysis was complemented by a qualitative analysis of the coordination processes.
Results
During the actual crisis, several differences can be noted in the coordination processes of high and low performing crews. For example, anesthesia crews with higher MH-treatment scores less time on "task management" (Spearman $r=-.46$, $p<.05$). Specifically they spent less time on "task distribution" (Spearman $r=-.44$, $p<.05$) especially with team members outside the anesthesia crew (Spearman $r=-.60$, $p<.01$). Also, a higher proportion of the coordination activities of higher scoring crews was categorized as "coordination via work environment" (Spearman $r=.55$, $p<.01$). These results were complemented by qualitative analyses showing that lower scoring crews activate more resources than they can coordinate effectively, are more likely to split into sub-crews, and increase workload based on wrong assumptions.
Discussion
In this pilot study, we found differences in the coordination processes of anesthesia crews that are related to the technical performance during simulated crisis situations. Based on these results, a more comprehensive study looking at different types of crisis situations and including participants with different levels of experience will contribute to a better understanding of the coordination-performance relationship and finally to the development of specific coordination training to further improve performance.

Acknowledgements
This study was funded by the Swiss National Science Foundation (PBZH1-100994).

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Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1444
POSTER BOARD # 7

Becoming A Simulator Instructor And Learning To Facilitate: *Evaluation Of The Instructor And Facilitation Training – Infact*

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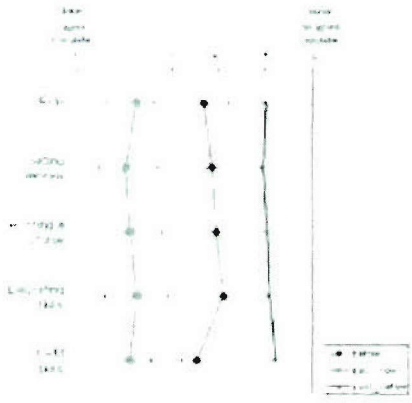
Background: Simulation-based training courses using video-debriefing techniques require very competent instructors, especially when focussing on human factors and crisis resource management (CRM). We developed an instructor course to help new users of simulation to use the tool of realistic simulation to its full potential. The Instructor and Facilitation Training (InFacT) was provided for approximately 170 future simulator instructors in Germany, Italy, and the Netherlands. InFacT focuses on realistic CRM simulator training with video-debriefing.
Method: The InFacT course runs four days and is divided into two blocks (two days each). Participants gradually switch from the role of a course participant in a simulator course (experience phase) into the role of a simulator instructor (InFacT "double feature" concept to allow for different perspectives of the trainees). Performing simulations and debriefings is the main focus of the course. Intermittent theory modules (patient safety, CRM, briefing and debriefing, the simulator setting, and scenario design) are supplemented by workshops, practice parts and extensive feedback. Participants begin to do debriefings and later scenarios and debriefings and receive feedback from themselves, other participants as well as from the interdisciplinary InFacT course directors. We report the detailed questionnaire based evaluation of three InFacT courses which were conducted at "SimuLearn" in Bologna, Italy with N=70 participants. Questionnaires contained 30 items on subjective competency ratings within five scales (clarity of instructor role, simulator setting overview, running a simulator course, debriefing skills, CRM skills). The questionnaire was filled in prior to (pre) and after the course (post_now, post_before), including methods to assess "response shift bias" (Howard et al., 1979).
Results: As a multivariate analysis of variance did not yield statistical significant effects between the 3 different courses the results were combined in figure 1. The repeated measures factor time (before, post_now, post_before) did yield statistical significance ($F(10, 29)=39,17$, $p<.001$ – Wilks Lambda): for all five scales subjective competency ratings after the course were higher than prior to the course. After the course the estimation of competencies prior to the course was lower than the same estimation before the course, indicating a strong response shift.
Conclusion: The results suggest that InFacT participants gained new insights into the task of being a simulator instructor for advanced simulation based courses. There was a strong response shift between pre and post_before ratings. Especially when comparing the "post now" rating with the "post before" rating there seemed to be a remarkable learning curve during the 2 x 2 days course. As several of the trained instructors successfully performed simulation courses after the InFacT these questionnaire-based findings are at least anecdotally supported in practice.



Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Board Member/Consultant/Advisor	SimuLearn, Bologna Italy - Dieckmann, Rall
Lecturer/Speaker	Laerdal International, Stavanger Norway, Laerdal Medical, Puchheim Germany - Dieckmann, Rall

ABSTRACT # 1448
POSTER BOARD # 87

Development of High Fidelity Simulations for Exploring Surgical Stress.

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Background

Excessive stress can impair surgical performance, but its impact on surgical competence is under-researched. Mapping intraoperative stress and defining coping strategies requires a systematic approach. We have developed a multidimensional stress measurement profile, combining individual stress indicators with coping skill assessment.

High fidelity simulations provide a standardized environment where stressors can be applied without jeopardizing patient safety. Surgical procedures must be sufficiently complex to generate stress levels in surgeons of varying experience. This study evaluates an innovative simulation design using carotid endarterectomy (CEA) under local anaesthesia.

Methods

CEA is a technically challenging procedure with potential intraoperative stressors (e.g. bradycardia, stroke, time pressure, managing a conscious patient while operating). Simulated CEA provides a framework for structured stress assessment, using physiological parameters (salivary cortisol, heart rate, heart rate variability), stress questionnaires, interviews and observations. Simulations used a full surgical team in our high fidelity simulated operating theatre. Trained actors portrayed patients. Each participant underwent two levels of challenge: non-crisis (routine CEA) and crisis scenarios.

Perceived difficulty and stress were compared between the scenarios. Realism was evaluated by interviews and rating scales, the latter compared between surgeons with different levels of CEA experience.

Results

56 full-scale simulations were carried out with surgeons of varying experience (range 2 – 34 years). Interview results showed that the CEA simulation challenged surgeons at all levels of experience. Non-crisis and crisis scenarios were perceived as significantly different in their levels of difficulty and stress (all $p<0.001$ Wilcoxon Signed Ranks Test). The realism of the simulation, in particular the crisis scenario, was rated as very high ($M=8.5$, $SD=0.86$; using a 0-10 scale). Experienced surgeons rated the realism significantly higher than surgeons with no previous exposure to a CEA ($p<0.006$ T-Test).

Conclusion

The experimental design using CEA simulation offers a feasible framework for applying a complex stress measurement set. The procedure enabled assessment of surgeons across a range of experience. This simulation provides a sophisticated research tool for exploring intraoperative stress and coping strategies, and offers a safe educational environment for surgical stress management training.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1449
POSTER BOARD # 39

Interventional Vascular Simulation Is Mostly Beneficial For Training Of Fellows And Teaching The Use Of New Devices And Procedures.

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Introduction: Interventional Vascular Simulation (IVS) is an emerging technology in medical education, although its full role has not been established yet. We report the evaluation of IVS in various training categories done by a large group of interventional cardiologists.
Methods: During TCT 2004, interventional cardiologists could participate in hands-on introductory sessions on 23 simulators made by 6 different manufacturers (CATHI, Immersion Medical, Medical Simulation Corporation, Mentice, Simbionix, Xitact) that simulated coronary, carotid, and renal interventions. At the end of the session, participants evaluated the simulators and educational sessions, and graded IVS as a training instrument.
Results: A total of 379 interventional cardiologists filled the evaluation form, of whom 75% were attending physicians, with mean experience of 8 years of interventional practice, and mean of 200 interventions per year. The Table summarizes the evaluation of IVS. Values are given on a scale of 1-5 (5=best, 1=worst). The sessions fulfilled the expectations in 91.2%, and obtained a score of 4.23. A total of 92.2% of the fellows and 95.3% of the attending physicians believed that simulator training should be implemented prior to training on patients.
Conclusions: As evaluated by large cohort of interventional cardiologists, IVS may provide the largest benefit for fellows training in interventional cardiology and for guiding the use of new devices and procedures. Further studies are needed to validate the benefit of IVS for training and credentialing.

	Grading (range)	
TCT simulation session rating	4.23 (4, 5)	
Resemblance of simulation to actual cases	3.69 (3, 4)	
Current technology status		3.77 (3, 4)
Benefit for fellows in cardiology	4.35 (4, 5)	
Benefit for fellows in interventional cardiology	4.46 (4, 5)	
Benefit to experienced interventionalists	3.83 (3, 5)	
Benefit for training for new device/procedure	4.44 (4, 5)	
Benefit to patients	3.82 (3, 5)	
Objectivity in credentialing process	3.73 (3, 4)	

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1451
POSTER BOARD # 33

A Computer-Based Simulation Of Diabetes Mellitus: A Tool For Teaching And Assessing Competence In Patient Care..

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The prevalence of diabetes is growing rapidly worldwide as a result of changing lifestyles. Fortunately, much has been learned and many new tools have been developed to improve management of affected patients. The increasing sophistication of diabetes management requires frequent updating of knowledge and skills to assure practitioners' competence.

A computer-based simulation of type 2 diabetes has been developed as a tool for practice and assessment of management of diabetic patients. At the core of the program is a series of equations that iteratively calculate serum levels of glucose, insulin, and counterregulatory hormones along with changes in underlying physiologic parameters (eg, insulin secretion, insulin sensitivity, hepatic glucose production). The basic equations include: insulin = $glucose^{m}$ [where m represents insulin secretion by the pancreas], and glucose = (k/insulin) + HGP [where k represents insulin sensitivity and HGP represents hepatic glucose production]. Each of these parameters can be altered by drugs, counterregulatory hormones, and the natural history of the disease. The complete mathematical model, which is derived from clinical studies of normal and diabetic individuals, realistically and faithfully simulates the clinical course of the disease, including biologic effects of hormones, drugs, caloric intake, and exercise; drug pharmacokinetics; glucose toxicity; and the chronic deterioration characteristic of type 2 diabetes.

The underlying physiologic parameters can be varied to produce a virtually endless supply of simulated patients with varying severity of diabetes. The calculations produce a full set of data for each 15 minutes during the day of a patient, and weeks worth of data are calculated in seconds. This time compression allows students to manage multiple patients over the course of months or years in a single sitting. Glucose levels are displayed on-screen in a replica of a log book typical of those used by diabetic patients. To enhance the realism of the program, the consistency of glucose readings and patients' adherence to recommended glucose monitoring can be varied. This allows a wide range of difficulty for learners at different stages of training.

Patients are managed with diet, exercise, and pharmacologic agents from all major classes of oral anti-diabetic drugs and insulins. Patients' adherence to therapy can be varied to increase the challenge for more advanced learners. Patients can be designed to have contraindications to specific drugs in order to assess the learner's ability to select drugs properly. Appropriate laboratory tests can be ordered and a history of results is displayed. Finally, learner's adherence to guidelines for diabetes management can be tracked.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1454
POSTER BOARD # 8

After the Fact: Using Performance Data from a Standardized Patient Examination to Inform the Curriculum.

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The University of Texas Medical Branch

Introduction: Standardized patients (SPs) are used in 96% of US medical school for teaching or assessment. The application of SP-based examinations to assess student skills has been studied extensively and is widely accepted. We have performed detailed reviews of outcome data from SP based examinations. We describe how this information can inform the educational curriculum

Methods: Our institution requires all medical students to successfully complete a SP-based clinical skills assessment early in the fourth year. This multi-station examination includes content from all third-year clerkship disciplines. Students are scored by the SPs on the medical interview, physical examination, counseling and interpersonal skills. A post-encounter note, scored by faculty, allows an assessment of written communication and integration of knowledge.
We have used a variety of approaches to ascertain general strengths and weaknesses of the entire student group including 1) checklist item analysis 2) comparison of overall performance across cases 3) review of SP comments 4) detailed review of written documentation and 5) video-review of specific scenarios.

Results: Our medical school class size is 200 students. Through careful analysis of the overall group performance we have noted deficits in specific content areas, patient age groups, and types of presenting complaints. (eg: extremes of age, constitutional or behavioral complaints) The SP comments have revealed global issues relating to patient comfort. Review of written documentation has revealed deficiencies in student identification of pertinent positive and negative information, and in the connection between data collection and diagnostic reasoning. Video-review of specific cases (eg: breaking bad news) has allowed us to pinpoint areas of general strength and weakness in complex communication issues.

Discussion: Information gained from detailed examination analysis has been provided to course directors and the curriculum committee. While deficits in individual students can be addressed with feedback and remediation for the learner, class level deficiencies suggest a mismatch between curricular objectives and student achievement. This latter finding provides the basis for discussion among educational leaders and informed curricular modification.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1455
POSTER BOARD # 51

Use of a Medical Simulator to Diagnose Amusia in an Anesthesiology Resident: SimMan Tunes in to Tone-Deafness

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This is a case report of a 25 year old anesthesiology resident who was felt to be inattentive in the operating room by several faculty on our Clinical Competence Committee. The Faculty member who did routine simulated cases with the residents in the anesthesiology simulator (SimMan - Laerdal Medical) did not agree with this assessment. However, he did notice that in this resident's previous simulation, visual cues were used to recognize the problem being simulated. It was considered that the resident had a hearing problem, so a simple simulation was created to evaluate the resident's ability to respond to monitor alarms and tone changes.

The resident was asked to sit in the simulator room (a mock OR) with their back to the monitors and instructed to imagine that they were putting a central line into the patient. The resident was instructed to comment on the patient's condition while they were putting in the line. The resident was instructed not to turn around to look at the monitors.

The resident recognized changes in heart rate and also noticed changes in the breathing rate of the mannequin system. However, when the oxygen saturation was changed (and the tone changed on the pulse oximeter), the resident did not notice any changes until the saturation had changed by 13 percent (100 to 87). The resident described the tone as "flattening". By comparison, the vast majority of anesthesiologists notice a tone change when the saturation changes by 1 or 2 percent at most. The pulse oximeter tones were changed several times during the session without any response by the resident.

During the debriefing session, the resident was shocked that this occurred. When the pitch of the tone changing from high to low was discussed, the resident did not seem to have a real concept of these changes (analogous to describing differences between red, orange, yellow, green, blue to a color blind person). The resident decided to go to an audiologist for formal hearing testing. This testing confirmed amusia (tone-deafness).

The resident was subsequently given simulation sessions to work on compensating strategies such as increased scanning of the monitors, decreasing extraneous noise and working to try to recognize more subtle tone changes. The resident Clinical Competence Committee was also informed of these findings and re-framed its evaluation of this resident in this regard. We present this case as an example of using a medical simulator (SimMan) to diagnose a hearing difficulty and provide opportunity for the resident to work on corrective strategies.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1460
POSTER BOARD # 102

The Development of a Role-Playing Simulation to Investigate Coordination of an OR Master Schedule.

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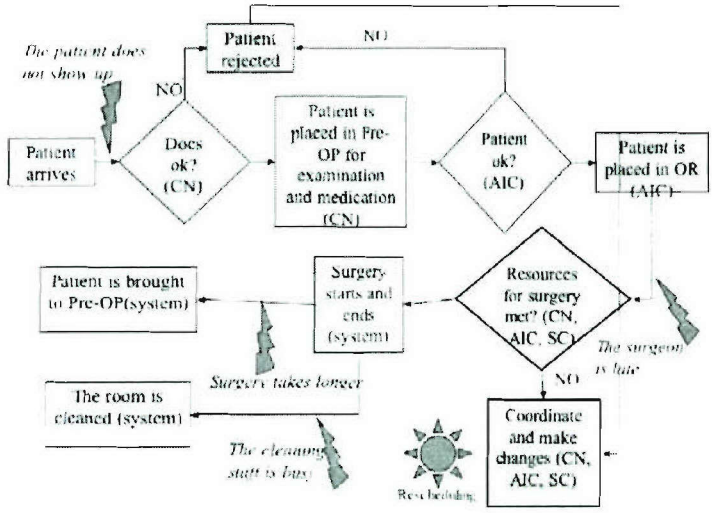
Guides, instructions, Author's kit, Conference PublicationsAddressÒs name* ReviewHeaderTextFor review only <ETH> do not cite or distributePublishHeaderText

The structure of many hospitals is team-based. Safety, efficiency, and performance depend on the ability of the organizations to support coordination and collaboration across teams, tasks, and resources. To develop adequate technologies to support these processes we need a deeper understanding of how different professionals manage multiple tasks and interruptions. The goal of this research is to simulate the coordination mechanisms and trajectories of hospital personnel as they move patients in and out of OR.



In the complex hospital environment, there are at least three key types of trajectories: (a) *patient trajectories* , (b) *resource trajectories*, (c) *staff trajectories*.

We developed a web-based role-playing game to simulate a master schedule in an OR. We ask three players to take on the role of charge nurse (CN), anesthesiologist in charge (AIC), and surgeon coordinator (SC) with the goal of attending to OR scheduling dynamics, as they manage their individual trajectories and objectives in the face of interruptions. The tasks that each player is responsible for performing can be classified into three types: (1) Facilitating patient flow through the OR, (2) Coordinating the master schedule, and (3) Managing resources.

Figure 1 depicts the flow of a patient through the system, and denotes the role of each player in this flow. Throughout the patient flow, various types of interruptions can occur (shown as lightning bolts). For example, a patient may fail to arrive at the appointed time, a surgeon could be late arriving for surgery, a surgery could take longer than expected, or the cleaning staff could be too busy to clean the operating room in time for the next surgery. These types of interruptions affect trajectories by requiring players to quickly converge on a problem that requires an immediate response.

We expect that trajectories will be influenced in part by the type and frequency of interruptions encountered by the players. By superimposing the interruptions on the reconstructed trajectories, we will be able to discern how different types of interruptions affect trajectories and, ultimately, performance. Moreover, by manipulating the perceived importance of competing objectives, we can also observe how these perceptions moderate the effect of interruptions on trajectories.

The design of the game was guided by the following considerations:
Collaborative Complexity: Collaborations should be sufficiently complex to reasonably represent a real OR unit, but simple enough to ensure that the game is playable.
Game Time: The game should represent a full 8-hour shift of OR unit surgeries. Game time is, therefore, accelerated over real time by a factor of 8. This allows an 8-hour shift to be "played" in one hour of real time.
Ease of Use: We chose to use a Web-based interface to leverage players' prior experience with Web technologies. This novel method of studying trajectories and interruptions will yield new insights into the processes that underlie collaborative work in critical environments.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1461
POSTER BOARD # 30

Evaluation of an electronic system to enhance crisis resource management training.

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University of Pittsburgh School of Medicine

Objective: To examine an electronic platform that engages medical crisis resource management (CRM) trainees in the performance critiquing process, and to assess the acceptability and credibility of the "individualized" feedback generated by the platform. The training is focused on organizational aspects of crisis management, and reinforces teamwork.

Design: An electronic critiquing and feedback platform was developed to (a) engage trainees in the critiquing process and (b) individualize feedback to trainees. This study –the second of two– focused on examining the credibility of the approach for generating individualized trainee feedback. All trainees used the system after every simulated crisis throughout the course, and their critiques were compared to that of an expert rater.

Subjects: Thirty-two physicians, nurses, and respiratory therapists participated in the study as part of their hospital mandated CRM training.

Procedure: CRM trainees experienced rounds of simulated crises on computerized mannequins followed by debriefing sessions that involved performance critiquing and feedback. Before starting the debriefing session, trainees critiqued their own performance and that of their co-trainees. All trainees instantly received individualized feedback based on their peers' critiques. A survey was administered to trainees to determine the acceptability of the approach.

Results: Electronic critiquing was always completed in less than 3 minutes, and did not interfere with regular training procedures. The system was unanimously perceived as intuitive and easy to use. All but one subject agreed that the critiques were accurate, motivational, improved their self-awareness, and enhanced their focus. Trainees extensively over-estimated their own and their peers' performance in the first simulated crisis, as well as that of their peers. During the second simulated crisis, trainees under-estimated their own performance. After the second crisis, trainees' perceptions became closer to the expert rater's assessments.

Conclusion: The electronic critiquing approach was acceptable and useful to trainees. The approach was credible for individualizing the feedback to trainees only after trainees became conscious about their own incompetence. Full scale simulation focused on organizational aspects of team performance during crisis is correlated with an improved ability to self assess performance. Discordance between perceived performance and actual performance decreases with training.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1462
POSTER BOARD # 65

A Cricothyroidotomy Simulator with Haptic and 3D Visual Feedback.

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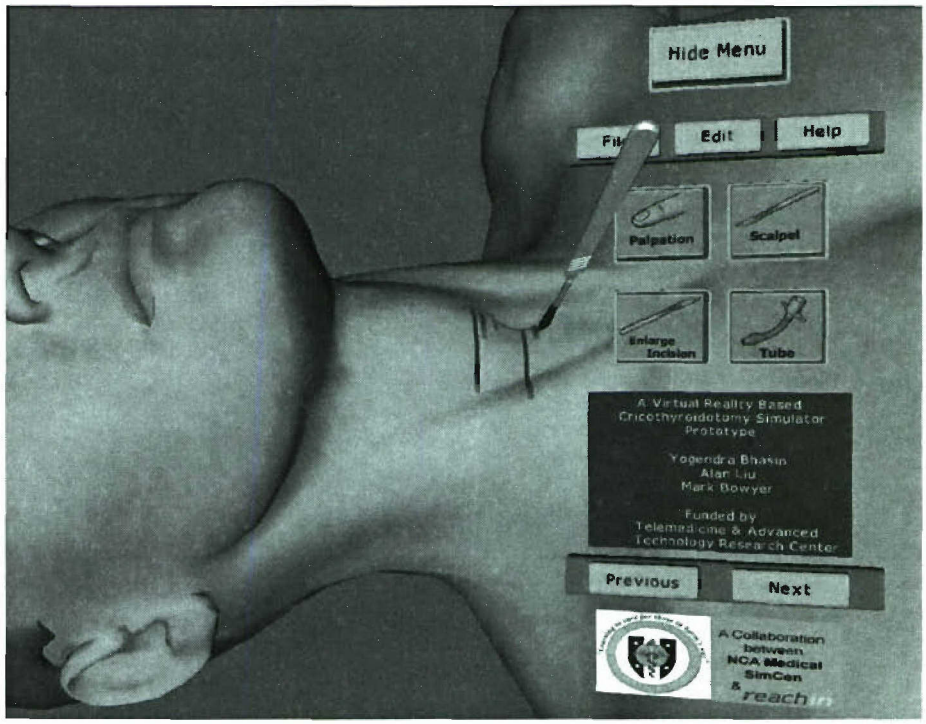
National Capital Area Medical Simulation Center

Aims

Open cricothyroidotomy is an essential skill in emergency airway management. It is the procedure of choice when ventilation cannot be achieved by less invasive methods. This skill has relevance to both military and civilian medical services. For example, cricothyroidotomy is the recommended approach for the management of certain thermal or toxic gas injuries during tactical field care. As another example, cricothyroidotomy may be necessary to secure the airway in gunshot wounds to the face, a situation that can be encountered both during combat and in the civilian emergency room . Current training models are inadequate from a physiological and anatomical perspective. We have developed a VR-based simulator that addresses these shortcomings. To date, no comparable computer-based simulator for cricothyroidotomy has been developed.

Methods



Our system is based on the Haptic Workbench. Using this paradigm, users can feel virtual objects in the same location as their visual sense reports. Hand-eye coordination is preserved. Our simulator teaches students the dexterous skills necessary for cricothyroidotomy. Students can palpate a virtual neck to locate the cricothyroid membrane. The thyroid model encodes the properties of various tissue types. The system uses a novel combination of texture-mapped visuals and haptic feedback to simulate cutting. This approach creates the appearance of incisions on the skin surface, but does not change the model's topology. Surgical effects, such as bleeding are generated. The system can also simulate endotracheal tube insertion.

Results

Fig. 1 is a screenshot of the simulator in use. Preliminary assessment by surgeons familiar with the procedure has been favorable. The evaluators commented favorably on the accuracy of tactile response during palpation, incision, and intubation, as well as the visual effects of bleeding.

Conclusions

A prototype cricothyroidotomy simulator has been developed. Initial evaluation by subject matter experts is favorable. Our next focus is to incorporate self- and cognitive-training capabilities in the simulator.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1464
POSTER BOARD # 58

Classroom instruction did not improve management of septic shock in a simulated setting.

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Background
Human patient simulation has provided a valuable tool in health care education with capabilities ranging from learning procedures, to improving disease management, and assimilation of more complex behaviors applicable to crisis management. Since 2001, the VA anesthesia/ ICU group has conducted monthly simulator session covering the management of respiratory failure and septic shock, as well as crisis management principles applicable to any emergent situation. Considerable variability in resident performance has been noted by the faculty during this time. Recently, a scoring system has been developed and validated for the analysis of the patient with septic shock. In attempting to understand sources of variability in performance, tapes of house staff managing the septic "patient" were reviewed, scored, and analyzed with respect to whether the simulation either came before or after a monthly lecture on the management of sepsis and shock.
Methods
The chronologic order of monthly simulation sessions and a lecture on the management of septic shock was prospectively scrambled. The rating system for management of septic shock consists of both technical (medical) and non-technical (behavioral) items; team performances were reviewed independently by two trained observers. All technical items were consistently covered in the lecture. Simulation sessions were conducted in a recreated ICU environment with a high-fidelity computer controlled mannequin "patient." The patient's deterioration followed a standard design with patient complaints and responses to therapy also standardized. Interns are introduced to the patient and manage it for the first ten minutes, even if help is called for earlier. Following ten minutes, back up residents, fellows and consultants are allowed to participate in patient management. Technical scores were made for the first ten minutes (interns), and the subsequent 20-25 minutes of the scenario. Non-technical scores were calculated for the whole group only. All participants completed a post course survey; comparison between the groups receiving the lecture before vs. after the simulation was made by t-test.
Results
Results from 22 consecutive simulations of septic shock were analyzed. Over 95% of participants found the scenarios realistic, lifelike, acknowledged that they elicited lifelike behaviors. No difference in technical or non technical performance between the "before" and "after" groups were
identifiable. Analysis of individual items comprising the total score were analyzed, and again failed to reveal a difference between the "before" and "after" groups.
Conclusion
It is desirable to have objective and robust means to understand which forms of education lead to improved care of critically ill patients. With the availability of high-fidelity human patient simulators in a recreated clinical environment, it is possible to analyze decision-making and management of "patients" in fast-paced and high-risk situations. A scoring system evaluating technical and behavioral aspects of managing septic shock was developed and used to analyze the performance of house staff in managing a simulated patient with sepsis either with the "benefit" of a lecture on shock management before the simulation, or not. We found that the ability of classroom instruction to improve clinical performance was at least for this case, non-existent.

Average Score	Technical	score	Behavioral score		
	Intern	Whole Team	Whole team		
Simulation before lecture	6.90	9.00	27.20		
(SD)		(2.46)		(1.35)	(5.87)
Lecture before simulation	6.63	8.13	23.75		
(SD)	(1.90)	(2.18)	(6.30)		
p value of before vs. after	0.770	0.283	0.202		

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1470
POSTER BOARD # 81

Peri-operative Simulation Training Prior to Opening a New Hospital: Can it Improve Quality and Patient Safety? A Pilot Study.

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Introduction: The report from the National Academy of Sciences' Institute of Medicine cited studies showing between 44,000 and 98,000 people die each year because of mistakes by medical professionals. Our hospital system and many others in the United States have taken a proactive stance to improve quality and eliminate many of these errors. The Leapfrog Group has created a new initiative based on the National Quality Forum's (NQF) Safe Practices for Better Healthcare: A Consensus Report. The Consensus Report endorsed 30 practices that should be universally used in applicable clinical care settings to reduce the risk of harm to patients.

Methods: Our multidisciplinary study group has developed three peri-operative scenarios: one preoperative, one operative, and one postoperative. Each scenario will include the concepts of safety using ten National Quality Forum Safety Practices which are directly applicable to peri-operative nurses (e.g., verbal orders should be recorded whenever possible and immediately read back, use standardized abbreviations and dose designations, implement standardized protocols to prevent wrong-site or wrong patient procedures). All newly hired peri-operative nurses will be recruited to undergo the simulation training and testing during the period from hospital facility opening until the time of actual patient care. Participation will be voluntary and in addition to their existing preclinical training. Before beginning any training, all participants will complete a questionnaire assessing NQF Safe Practices knowledge. The simulator scenarios will be run with peri-operative nurses participating in their own work environment. Participants will again complete the questionnaire assessing NQF Safe Practices knowledge in the 2-7 days immediately after the simulation training. Further, the hospital system routinely administers Safety Culture Climate tool to all clinical employees for quality assurance measures. We will administer the tool in the week before simulation training, during the 2-7 days immediately following simulation training, and again at two, eight, and fourteen months after beginning patient care.

Results: We have developed standard peri-operative human simulation scenarios that can be utilized to train and test peri-operative healthcare nurses with regard to adherence to National Quality Forum Safe Practices. We have gathered preliminary evidence to determine if our peri-operative nurse human simulation training improves implementation of and adherence to the NQF Safe Practices. We have performed a short-term assessment of adherence to NQF Safe Practices by comparing the NQF Safe Practices knowledge of newly hired perioperative nurses both pre- and post-simulator training. This short-term data will be presented at the meeting. In the long term, we will track average perioperative nurse safety culture scores as progress over the following time points: pre-simulation training, immediately post-simulation training, and 2, 8, and 14 months after beginning patient care.

Conclusion: Together, the short-term and long-term assessments will serve as pilot data to support the development of hospital-wide simulator training protocols.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1472
POSTER BOARD # 57

Enhancing Recently Graduated Nurse Health Assessment Knowledge And Skills Using Low Fidelity Adult Human Simulation.

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Southern Health, Victoria, Australia

Aims
This research aims to investigate the impact of three different learning interventions on graduate nurse health assessment knowledge and skills.

Background
While the use of simulation technology in nursing education is becoming increasingly commonplace, few researchers have examined the effect of simulation on the acquisition of clinical knowledge and skills. It was hypothesised that the patient assessment skills of graduate nurses who complete a simulation learning activity will be superior to those who complete traditional education activities.

Method
Graduate Nurses ($n = 76$) were randomly allocated to three groups (1: self-directed learning package [SDLP] only; 2: SDLP plus two scenario-based PowerPoint workshops; and 3: SDLP, plus two simulated patient assessment teaching sessions (replicating the PowerPoint scenarios) using a low-fidelity manikin. Following the education activities, all nurses completed an individual test scenario where they performed a systematic patient assessment upon the manikin, scored using a checklist of relevant observations and actions.

Results
Analysis of Variance results suggest that the mean test score for nurses in the simulation group ($M = 135.52$, $SD = 26.63$) was significantly higher ($p < 0.001$) than those in the self-directed learning group ($M = 107.42$, $SD = 29.82$) and the PowerPoint group ($M = 102.77$, $SD = 31.68$).

Conclusions
Simulation appears to be an effective method of teaching patient assessment knowledge and skills to graduate nurses. The incorporation of such technology into both undergraduate and graduate nurse education may increase confidence and decrease the time taken to become clinically proficient, concomitant with improved patient outcomes and health care services.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1473
POSTER BOARD # 98

Simulation: What does it really cost?.

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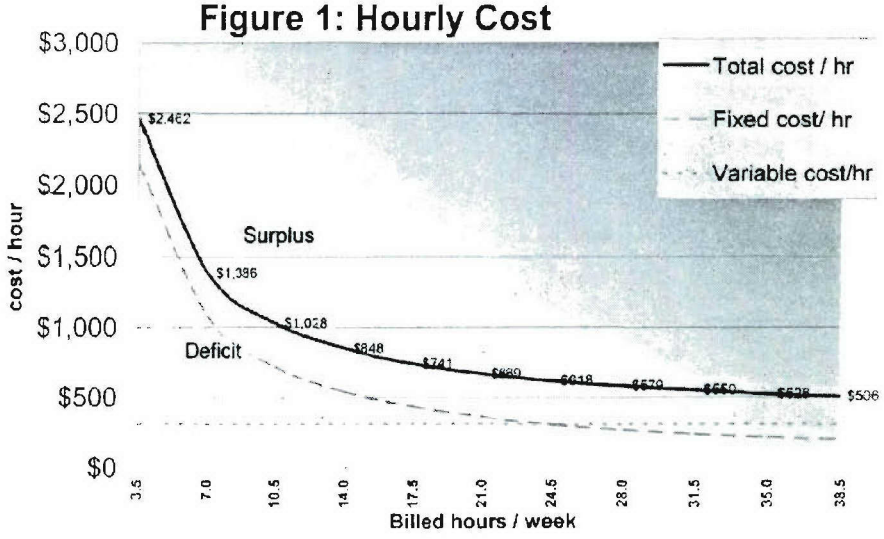
Introduction: Simulation based training is increasingly recognised as a part of health care education and as a means to improve patient safety. The number of centres worldwide has increased exponentially since 1994. However, little is known about the economics of simulation centres. The objective of this study was to determine how much it costs per hour to run a simulation centre. These data make it possible to calculate how much to it is required to charge per course in order to cover costs.

Methods: We calculated the hourly cost for our model simulation centre applying a 'bottom-up' or micro-costing technique. Fixed (overhead) and variable costs were estimated by using market rates for different items. Using the total (fixed plus variable) cost per hour we used computer spreadsheet modelling to calculate how many hours a centre needs to bill to cover costs.

Results: Set up cost was US$876,485 (renovation of existing facility, equipment). Fixed costs per year totalled $361,425. Variable costs totalled $311 per course hour. The economic benefits of increasing the number of billable teaching hours per week are significant until about 21 hours (equivalent of 3 full or 6 ½ day courses) per week (averaged over 52 weeks/year) when they start to taper off. Figure 1



Conclusions: Due to the high fixed (overhead) cost structure of simulation centres, economic viability is directly tied with the number of billable hours taught per week. Any lull in business can significantly affect the bottom line. Understanding the cost structure should be used to guide rational growth in numbers of simulation centres. Minimising costs may necessitate co-operation and sharing of resources between centres. Our results suggest that economic viability of simulation centres may depend on subsidies from institutions or other external sources. This is in line with the experience of the Bristol Medical Simulation Centre who reported that in excess of 50% of their running costs needed to come from commercial sources. How a centre maintains financial viability may depend on a country or an institution's philosophy about whether centres should be government or health system funded or whether charging participants is preferable or some combination. These are complicated political issues with pros and cons for each funding model. In theory, simulation offers great potential to reduce health care costs by improving patient safety and also by reducing staffing costs via decreased training time and reduced turnover of staff. Sufficient numbers of course participants to justify simulation centre costs may be achieved if the benefits of such training are fully recognised through careful validation studies.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1474
POSTER BOARD # 93

The Value of Using the TraumaMan® Simulator to Teach Chest Drain Insertion During the ATLS Course.

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Background: The Trauma-Man® simulator (Simulab, USA) was announced by the American College of Surgeons as a legitimate alternative to the ATLS animal surgical skill station. The aim of this study was to assess the value of using the simulator to teach chest drain insertion during the ATLS course by acquiring experts' and trainees opinions.

Methods: Following chest drain insertion to the TraumaMan simulator, 24 experienced ATLS instructors (5 cardio-thoracic surgeons, 14 general surgeons experienced in trauma management and 6 anesthesiologists) completed a subjective questionnaire. Questionnaires were also used for assessment by 42 novice participants of the ATLS course trained with both animal skills laboratory and the simulator.

Results: Median scores on a scale of 1 to 6 (1 indicates "not similar at all" and 6 indicates "identical") given by the experienced physicians to the various steps required for chest drain insertion were: anatomical landmarks - 5, tactility of the skin -4, skin incision-4, dissection of tissues-4, identification of the pleural space-5, tube insertion to the pleural space-5, and chest drain fixation -5. Trainees of the ATLS course asked to comment on the ability of the model to teach these steps of the procedure, gave median scores of: anatomical landmarks - 5, tactility of the skin -5, skin incision-5, dissection of tissues-4, identification of the pleural space-5, tube insertion to the pleural space-5, and chest drain fixation -5. The trainees found the TraumaMan superior to the animal model in representing the anatomical landmarks, and inferior in the dissection of tissues.
Experts recommended the simulator to be used to train novice physicians in chest drain insertion (5.5±0.8, in a scale of 1-6, 1 indicates "not able at all" and 6 indicates "very useful"). However, changes aiming to improve the representation of the "safe triangle" of chest drain insertion were recommended. In the current version of the simulator, part of the area designated for chest tube insertion is outside the triangle.

Conclusion: The Trauma-Man simulator was recommended as a training tool for chest drain insertion by both ATLS experienced instructors and novice trainees. Further improvements in the model were recommended.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1475
POSTER BOARD # 95

Simulation Based Training for Focused Abdominal Sonography for Trauma (FAST) Performance

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Background: The use of focused abdominal sonography for trauma (FAST) allows for rapid bed side diagnosis of intra-abdominal, pleural, or pericardial hemorrhage in trauma casualties.

Purpose: To develop and validate a training program for FAST performance for non radiologists using the UltraSim simulator.

Methods: The training and evaluation program included – 1. Introductory computer based lecture for self learning of the general principles of ultrasound and FAST. 2. Introduction and hands on session on the simulator. 3. Pre training simulator based evaluation consisting of two scenarios. 4. Six training scenarios. 5. Post training evaluation consisting of two scenarios.

Results: 20 physicians (3 radiologists, 5 surgeons experienced in FAST performance, 5 surgeons with moderate experience in Fast performance and 7 novices) participated in the study. During the pre training evaluation, only 14 (70%) participants correctly placed the transducer in all the examination positions, and only 5 (25%) were able to maintain the correct direction of the transducer. During the post training evaluation both parameters were correctly maintained by all participants ($p<0.001$). The time required for obtaining the image in each of the examination positions was 133±87 seconds prior and 86± 58 seconds following training ($p<0/001$). The quality of the images obtained, subjectively assessed by a radiology specialist, was 7.2±2.1 prior and 8.4±1.2 following training (scale of 1-10) ($p<0.001$). Correct diagnosis (positive / negative) was made in 69% and 89% for pre and post evaluations respectively ($p<0.001$). Construct validity was demonstrated in all the evaluation parameters. Never the less, radiology specialists were still better then other participants in the time required to obtain the images, quality of the images and the incidence of correct diagnosis.

Following training participants indicated that the opening presentation taught the principles of FAST, the clinical scenarios represented real clinical situations; and that the simulator system presented a real imaging situation (scores of 5.6±0.4, 5.6±0.8, 4.9±1.0, respectively in a range of 1-6). Participants recommended to use this training modality for all trauma physicians (score of 5.9±0.2). Criticism included low-quality imaging and lack of cardiac or respiratory motion.

Conclusion: Although data are preliminary, this study clearly demonstrates the value of simulation based training for FAST performance. Furthermore, face, content and construct validity were achieved.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1476
POSTER BOARD # 9

Curricular Integration of Human Simulation Education Across Programs:SEGUE at the University of Pittsburgh School of Nursing.

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Introduction:
The University of Pittsburgh School of Nursing (SON) integrated full context simulation education using high fidelity human simulation into the graduate curriculum in 1994 and the undergraduate curriculum in 2001. Capability to offer more frequent simulation courses was limited due to simulator access and lack of faculty experience with the approach. In 2001, the SON purchased the Laerdal SimMan™ with an internal technology grant and constructed a fully equipped simulation lab. Several faculty served as thought leaders to advocate for use of this educational approach in both graduate and undergraduate curricula. With the opening of the Winter Institute for Simulation, Education, and Research (WISER) in 2004, opportunity arose for a top down curricular integration effort. An oversight committee titled Simulation Efforts in Graduate and Undergraduate Education at the School of Nursing (SEGUE) was constituted. This committee was composed of simulation experts within the SON with mandate to gather data with respect to current state of Nursing Simulation efforts, assure quality within all simulation educational efforts, and work in concert with undergraduate and graduate curriculum committees. The committee has matched SON simulation modules into an experience matrix reflecting clinical requirements established in the AACN (American Association of Colleges of Nursing) Essentials of Baccalaureate and Masters Education.

Methods:SEGUE first met in September 2004. All courses in the undergraduate and graduate program utilizing HFHS mannequins were identified by faculty report. All simulation activities and hours per student for the 2005 academic year were recorded. Simulation scenarios within courses were stratified by body system. Data on student enrollment in each level of the undergraduate and graduate curriculum was obtained from the Department of Student Services. A meeting with School of Nursing faculty involved in human simulation education was held in December 2004. A simulation education meeting specific for nursing educators was planned for July 2004. All data was entered into a spread sheet and descriptive statistics were performed using Excel 13.0™.

Curricular Integration of Simulation Experience at the University of Pittsburgh School of Nursing

	Total Students	Annual Sim Modules	Avg. Annual Sim Hrs. per Student	Cumulative Hours in HFHS
Freshman (UG)	130	2	4	520
Sophomore (UG)	127	-	0	0
Junior (UG)	122	3	16	1952
Senior (UG)	111	1	8	888
Senior elective (UG)	20	2	16	320
Accelerated (UG)	20	2	16	320
Fast-Track-Back (RN)	10	2	8	80
Anesthesia (G)	110	10	56	6160
NP Programs (G)	60	2	16	960
Independent Study (UG/G)	10	4	32	320
Total	593	29	16.7	11528

UG = Undergraduate, G = Graduate, RN = RN Re-Entry to Practice Program

Results:
Total student simulation hours was collected per student, by level, and across the SON curriculum. Wide variability exists within the undergraduate level as well as between graduate programs. A total of 11,528 hours of hands on simulation was performed in 2005 (mean = 16.7 hrs. per student). A total of 593 out of 1050 students at the School of Nursing (56.5%) participated in a total of 133 Nursing Scenarios. The beta model of SimBaby™(Laerdal, Inc.) was used throughout the 2004-2005 academic year and programmed in eight separate scenarios. Cognitive, psychomotor, and affective elements were evaluated through multiple IRB protocols.

Standardization of evaluation tools is underway with pilot tools in use across the SON simulation curriculum.

Conclusion: The integration of nursing simulation educational efforts has been a combination of grass roots advocacy and 'top-down' administrative support. SEGUE has helped to further stimulate and accelerate integration of the educational approach. Benchmarking goals linked to accreditation requirements is a powerful inducement for change. Subsequent work will focus on development of reliability and validity metrics.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1479
POSTER BOARD # 41

COMBINING STANDARDIZED PATIENTS WITH SIMULATION TECHNOLOGY AT A NATIONAL SPECIALTY EXAMINATION.

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Standardized patients (SPs), often lacking physical abnormalities, are frequently employed in high-stakes assessments of clinical competence. Incorporating simulation technology with SP assessments offers the advantage of standardizing patient abnormalities, provided that the assessment process demonstrates acceptable validity evidence.

The objective of this study was to develop, implement, and validate OSCE-format stations that combined simulation technology with SPs for the 2004 Royal College of Physicians and Surgeons of Canada's Comprehensive Objective Examination in Internal Medicine.

Digital audio-video simulations of cardiology and neurology physical abnormalities were included in 11 SP OSCE-format stations. Two examiners evaluated each candidate's performance. Reliability and validity data of the stations was assessed. Examiners were tested on a sub-set of the audio-video simulations.
Inter-rater reliability for the audio-video simulations ranged from 0.83-0.85. Construct validity was addressed by assessing candidates' and examiners' diagnostic accuracy for a sub-set of simulations (mean score 0.79 +/- 0.26 and 0.84 +/- 0.24, respectively). Post-examination surveys confirmed face validity.
Incorporating simulation technology with an SP assessment represents a feasible and valid approach to the assessment of clinical competence in a high-stakes setting.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1480
POSTER BOARD # 61

LAPAROSCOPIC SIMULATION, Who can be trained?.

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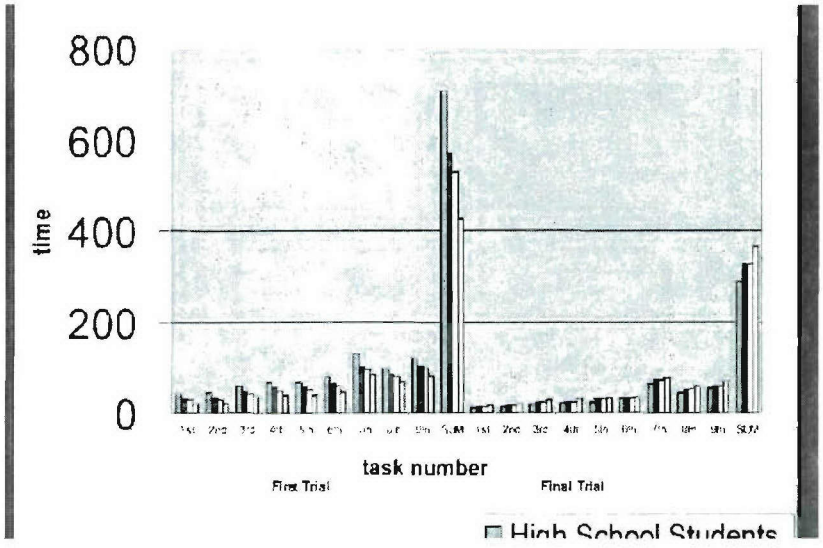
University of Arizona - College of Medicine - Arizona Simulation Technology and Education Center (ASTEC)

Introduction:
Simulation is of proven values in medicine especially in minimally invasive surgery (MIS) training, as the acquired skills are transferable into the clinical practice. MIS is well known to have long and variable learning curves. If successive generations of surgeons were able to cut down on training time, and learning curves could plateau earlier with each generation of surgeons, then how early in the medical education can we integrate simulated laparoscopic skills?

Material and Method:
Thirty two trainees at various educational levels and ages were recruited to our study. Trainees were divided into four groups of eight individuals. The first group was composed of senior high school students, the second senior undergraduate college students, the third medical students, and the fourth PGY1 & PGY 2 surgery residents. The trainees were asked to perform nine successive assigned tasks, in a laparoscopic training box. Each task was repeated five times to assess the maximum efficiency of carrying out the skills.

Results:
Surgery residents carried out the first trial within the shortest median time (427 ± 46) second. There was no significant difference between the medical students (530 ± 70) seconds and the college students (573 ± 47) seconds. High school students exhibited the longest time in the first trial (706 ± 93) seconds.

At the end of the five trials the high school students were the fastest after repeating the tasks five times (289 ± 24) seconds. They were followed by the undergraduate students (329 ± 33) seconds and the medical students (328 ± 29) seconds. Interestingly the residents were the slowest (366 ± 52) seconds.



Conclusion:

This preliminary data suggests that younger individuals may be able to acquire laparoscopic skills with more efficiency than more senior students and residents. This raises the larger question on how we may need to select future candidates for surgical training based, in part, on psychomotor information and skills acquisition.

Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Other	Univeristy of Arizona - Mollege of Medicine

ABSTRACT # 1481
POSTER BOARD # 10

Recognition and treatment of unstable supraventricular tachycardia by pediatric residents in a simulation scenario

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Background: Supraventricular tachycardia (SVT) is the most frequent form of symptomatic tachydysrhythmia in children. Therapy depends on the individual situation, but in severe hemodynamic compromise, it should be terminated immediately by external cardioversion. Despite this, no studies to date document whether pediatricians can differentiate "stable" from "unstable" SVT and make therapeutic decisions based on this discrimination.

Purpose: 1) To establish time to recognition and successful cardioversion of simulated unstable SVT by pediatric housestaff and 2) to document delays to initiation of and mistakes made during cardioversion.

Methods: Utilizing Laerdal's® SimMan, ten different teams of pediatric residents were presented with an unresponsive patient who had narrow complex tachycardia with no P waves, low BP, and a weak pulse (i.e. unstable SVT). Events and time logs were downloaded from the simulator computer. Time to successful initiation of cardioversion was measured. Therapies instituted prior to cardioversion and mistakes made during cardioversion were recorded.

Results: Ten scenarios were analyzed. Median time to successful cardioversion was 8.9 minutes (range 5.3 min to ∞). In 20% of scenarios, the patient was never cardioverted (1 due to lack of knowledge in defibrillator functionality and 1 due to lack of recognition for need to cardiovert). In 90% of scenarios, adenosine was given but 44% of those attempts demonstrated incorrect drug administration technique. Other maneuvers made prior to cardioversion were as follows: 70% gave fluid bolus, 60% attempted vagal maneuvers, 30% requested electrocardiogram, 30% requested an antiarrhythmic other than adenosine, 20% administered epinephrine, 20% requested a lab draw, and 10% requested cardiology consultation. In 20% of scenarios, the rhythm was misidentified (1 as ventricular tachycardia and 1 as sinus tachycardia). When cardioversion was performed, 25% failed to use gel with paddles, 37.5% failed to use synchronization, and 25% used an inappropriate energy dose. In 60% of scenarios, there was no oxygen administration. In 90% there was no formal assignment of Glasgow Coma Scale, and no assessment at all of mental status in 30%. In 60% there was no assessment of perfusion or capillary refill.

Conclusions: The median time to successful cardioversion of 8.9 minutes is inconsistent with the American Heart Association recommendation for treatment of unstable SVT with "immediate cardioversion". Many delays to cardioversion were secondary to lack of recognition of "unstable" SVT, due to failure to assess perfusion and mental status. Even with successful cardioversion, errors in technique and dosing were frequent. Mistakes and delays encountered during the SVT simulation identify targets for future educational interventions. When designing curriculum for pediatric housestaff, this data will be used to emphasize the importance of using definitive criteria to discriminate between "stable" versus "unstable" SVT, and to use this discrimination in therapeutic decision making.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1482
POSTER BOARD # 11

Promoting Teamwork in Emergency Medical Services through Advanced Life Support Competitions.

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University of Miami Miller School of Medicine

Introduction: As Emergency Medical Services (EMS) practice moves to protocol-driven care, providers must be able to manage a multitude of emergencies in a team approach. Although teams and teamwork are a significant component of the pre-hospital medical delivery system, they are rarely included in training or quality improvement efforts. The most common model is to train and assess EMS providers as individuals, and expect them to naturally perform well as teams. EMS competitions may offer the opportunity for providers to effectively evaluate themselves against their peers in a competitive, high-fidelity arena with no risks to real patients.

Methods: We followed an 11-step development process for each competition that includes development of Advanced Life Support (ALS) objective-structured clinical examinations (OSCEs) that are evaluated by an expert panel to ensure reproducibility, reliability and validity. Emphasis is also placed on the practicality of the OSCE, including scene design, use of standardized patients and simulators, effectiveness of evaluation tools, examiner training, and event logistics. A high degree of realism is embedded to enhance the patient representation and environmental surroundings. After each competition, formative feedback is given allowing teams to learn from their performance and a questionnaire, design to capture team characteristics is completed.

Results: Since 1992 we have conducted 14 annual competitions involving 170 teams. Competing teams comprised of three pre-hospital providers, generally from the same department. Winning teams shared the following characteristics: consistent, organized approach to rapid clinical assessment and management, effectiveness leadership with clearly defined team roles, equipment customization and organization, patient and equipment centralization, routine practice to refine psychomotor and communications skills, local medical director support.

Conclusion: Many argue that experience is the best teacher. This is often dangerous for the patient and impractical for an EMS system to assess pre-hospital providers in their actual working environment. ALS competitions allow EMS providers to test their expertise in patient assessment, communication, and multiple emergent patient management problems as a team in a safe simulated environment.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1483
POSTER BOARD # 12

Simulator-based Cardiac Life Support Rounds: the development of a novel inter-professional curriculum.

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Background: Medical schools are reevaluating their teaching systems in an attempt to become more accountable to their students while maintaining the importance of patient care and safety. Current trends in clinical teaching have evolved to facilitate learning in a way that understands the unique manner in which health care teams interact and treat patients.

Purpose: We sought to develop an inter-professional curriculum for nursing students, medical students, and junior medical residents using high fidelity medical simulation. Its purpose is to provide an opportunity for students to practice their basic resuscitation skills as a team, within a simulated clinical context, and to promote an appreciation and respect for each other's profession.

Method: The simulator-based inter-professional program consists of two hour sessions, held once weekly during the academic year. The sessions involve small groups of students working as a team through predefined simulated medical scenarios using high fidelity patient simulators. These scenarios are planned, implemented, and facilitated by physician and nursing faculty with an established interest in medical simulation. All sessions involve debriefing sessions to introduce, develop, and reinforce concepts of resuscitative care and crisis resource management and are facilitated by the faculty instructors. All students complete an anonymous evaluation of the program via a standardized questionnaire using likert rating scales. Participant scores are continuous from 1 (strongly disagree with statement) to 3 (neutral) to 5 (strongly agree with statement).

Results: A total of 50 evaluations have been completed in the early stages of this program. Initial responses reflect a positive attitude toward this novel multi-professional program. There is universal agreement (n = 50) that these rounds add value to training (mean score = 5) and provide a vehicle for understanding team roles in resuscitation (score = 5). All participants agree, or strongly agree, that these rounds promote further desire for inter-professional (mean score = 4.7) and simulator-based medical training (mean score = 4.8), and should be mandatory for all medical and nursing students, as well as, postgraduate medical trainees(mean score = 4.8).

Conclusion: The simulator-based cardiac life support rounds are accepted uniformly among medical and nursing participants as valuable learning experiences. We believe this program is the first of its kind in Canadian medical schools and offers students an early opportunity for the development of crisis resource management skills in a protected simulator-based inter-professional setting.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1484
POSTER BOARD # 13

STUDYING WITH THE *MASTER*: CAN WE ASSURE CRITICAL THOUGHT IN CRITICAL CARE? A PILOT STUDY.

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House officers often struggle with diagnostic decision and focus, but few resources are available to train for critical thought outside the actual clinical environment. One-on-one faculty mentoring of residents used to be the cornerstone of clinical education, but such protected time is now subjugated to the demands of increasing patient flow and the reduction in resident work-hours. Although the advent of full-body patient simulators provides a safe venue for critical care training and evaluation, it has been challenging to integrate individualized teaching and assessment protocols within active residency programs.

Purpose: To pilot individualized faculty-resident training sessions in the simulator lab. We hypothesize that individualized clinical teaching, case review, and faculty evaluation can enhance the learning and evaluation process for apprentice doctors managing critical events.

Methods: During the spring and summer of 2005, emergency medicine (EM) and internal medicine (IM) residents assigned to the MGH Emergency Department (ED) were offered the opportunity to spend a single hour in the ED-based simulator lab (MGH-Affiliated Simulation Training in Emergency Resuscitation [MASTER]). The lab was staffed with a paramedic educator who provided 4 ten-minute cases for the residents to navigate. Each case was developed to train and assess for critical diagnostic and therapeutic decisions in emergency and critical care medicine. Residents were assigned a faculty member to mentor them in real-time in the lab, or to meet and review a videotape of their performance at a later date. Faculty filled out a standardized scoring form and provided remediation as necessary; residents filled out a basic evaluation form. A DVD record of the encounter was made and archived.

Results: Three MGH teaching staff (2 EM staff and 1 critical care fellow) completed 12 mentoring sessions as part of this pilot. Of the 11 residents (5 EM and 6 IM) who filled out an evaluation form, 10 of them (91%) rated the exercise as "excellent" (highest on a 5-point Likert scale). Nine of the residents (82%) indicated that the session "definitely" inspired them to pursue further learning. Commentary among the group included: "Feels just like real life"; "the most helpful part was having an expert review the case with me directly afterwards...I also found it very valuable to work in a solo environment where I am forced to make decisions alone"; "opportunity to try and handle acute situations on your own"; "real scenarios—forces you to make clinical decisions"; "always helpful to do simulation—especially alone!"; and, "very good to have 1 on 1 time with attending...liked getting objective scoring."

Conclusions: Individualized simulator-based training and evaluation is feasible within the infrastructure of busy residency programs. Such sessions can promote objective assessment and self-directed learning, and are highly valued by the residents.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1485
POSTER BOARD # 14

How Valuable Are Longitudinal Simulation Exercises As Part Of An Integrated Clerkship?.

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Realistic simulation exercises are usually conducted as an adjunct to traditional medical school curricula. Students typically have only a few exposures per year (at most), with each session lasting for 1-2 hours. Every year, however, students ask for more exposure to the simulator lab.

Purpose: To determine the feasibility and usefulness of expanding simulator use throughout the third-year clerkship experience. We hypothesized that simulation could be integrated into an existing clerkship plan with minimal resources and time, yet produce significant benefits to the students.

Methods: During the inaugural year of the Cambridge Integrated Clerkship (2004-5), course directors and faculty agreed to pilot the expanded use of simulation within the clerkship curriculum. Each week of the curriculum was devoted to a core clinical topic. If faculty decided that realistic simulation would be useful in helping students to understand the topic of the week, they scheduled a 1-hour simulator session at the Center for Medical Simulation. On appointed weeks, students would leave the hospital and meet at the simulator lab in Cambridge (from 5-6 p.m. on Fridays). During these sessions, the relevant case material would be animated on the simulator. Four students would manage a clinical case as if they were interns in the hospital, while the other 4 would watch from the control room. After completion of the case (30 minutes), the entire cohort of 8 students reunited for a period of faculty-guided discussion and debriefing (30 minutes). At the end of the year, students were asked, "How valuable would you say the simulation exercises you completed this year have been to your development in becoming a competent physician (scale of 1-10)?

Results: Depending on the topic and weekly faculty leader, simulation sessions occurred weekly to monthly throughout the year. Simulation topics included: shortness of breath, chest pain, heart failure, abdominal pain, pelvic pain, liver disease, headache, back pain, diabetes, hypertension, stroke, shock, electrolyte disturbance, substance abuse, and labor and delivery. The average rating of the simulator sessions among 8 clerkship students was 9.4 (scale 1-10). Five students (63%) rated the simulator experiences as 10 (extremely valuable to their development as a physician during the year); 2 students (25%) rated the exercises as 9, and one (13%) rated the sessions as 7. Commentary on written evaluations included "this was one of the most valuable experiences this year throughout" and "we did not have enough of them."

Conclusion: Longitudinal incorporation of simulation exercises into the clerkship year is feasible, and is highly valued by students. Based on this pilot, the Cambridge Integrated Clerkship will institutionalize weekly simulator sessions as part of their curricular plan.

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Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1486
POSTER BOARD # 15

Moving The Patient Bedside Into The Tutorial Room: A Medical Classroom For The Future

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One of the goals of educational reform is to preserve the most effective components of traditional teaching while introducing new approaches that enhance learning. Such an integrative approach requires close collaboration and experimentation among faculty, educators, and students.

Purpose: To design and pilot a high-tech learning environment that enables the seamless integration between traditional pedagogy and the patient bedside. We hypothesized that such a classroom could provide a robust platform for testing a variety of educational approaches.

Methods: A group of educators worked to conceptualize an all-inclusive Medical Classroom for the Future. The intent was to provide an environment which could bridge the lecture, tutorial, and laboratory experience of the preclinical years with the bedside teaching, advanced debriefing, and competency assessment of the clinical years. Each of four classrooms was outfitted (1) as a traditional small group tutorial room, complete with a blackboard and conference table, and (2) as a patient care room with a stretcher and high-fidelity patient simulator (which could also accommodate standardized patients). The two modalities (tutorial room and patient bedside) were paired side-by-side, and shared a touch sensitive plasma screen capable of high-resolution display and web-based networking.

Results: Four integrated classrooms were exhibited at HMS for nearly 200 educators attending the 13-School Consortium and the AAMC Annual Meeting in Boston in the fall of 2004 ("An Expo of Educational Technology"). A case demonstration of asthma with pneumothorax was prepared and demonstrated, using all of the modalities embedded in each room. The case began with participants sitting around a tutorial conference table to discuss a New Pathway paper case. Subsequently the group got up from the table and turned to "meet" their tutorial patient—a simulator that began talking to them from the stretcher located just steps away. After interviewing, examining, and treating their "patient," the participants returned to the conference table, where they discussed the basic science of the case with the aid of web-based display material (MyCourses). Display adjuncts ranged from gross anatomy (annotated chest radiographs and gross pathologic specimens) to physiologic animation (dynamic diagrams with voice overlay from Human Systems Explorer), to virtual microscopy and pharmacology (identification of cellular receptors and structural material in the bronchial tree). Reactions to the demonstration were very positive.

Conclusions: A unified learning environment that integrates multiple components of the medical curriculum can be successfully constructed. Such a platform promises to be a useful setting for providing and testing a range of educational approaches.

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Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1487
POSTER BOARD # 66

Resident Self-Efficacy Assessment is Poorly Correlated with Simulation Performance.

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Background: Self-efficacy assessment (SEA) is a common method of physician competency evaluation. Recent commentaries by Ward[1] and Colliver[2] have raised questions about the utility of physician SEA in relation to other "gold-standard" evaluation methods such as standardized patient exams or expert ratings of performance. Previously published work has shown a wide variation in the relationship between SEA and other measures, with correlations as low a 0 and as high as 0.82. In this study, we compare SEA to performance in simulation-based case scenarios.

Methods: As part of a study of pediatric simulation-based assessment, first and second year pediatric residents from a single residency each completed two of four simulation scenarios, for a total of 104 simulation sessions. No resident repeated a case. For each scenario, a performance checklist was completed by three raters and a total score was calculated. The mean of the three scores was used as an overall global score. After each session, the resident recieved feedback on their performance and was asked to complete a survey including a SEA rating on a 0-100 visual analog scale. Subject's global scores were compared with their reported SEA rating and a Pearson's correlation coefficient (r) and a r^2 were calculated.

Results: All 52 residents completed the SEA. The data are displayed in Table 1. For the asthma and supraventricular tachycardia data only, there is a significant relationship between self-efficacy and performance. Even for these two cases, however, the low r^2 values demonstrate that no more than 15% of the variation in performance scores is explained by the variation in SEAs.

Conclusion: Resident SEAs, at best, weakly predict performance in our simulation scenarios. This lack of association occurred even though the residents completed their self-assessment immediately after participating in a simulation scenario and receiving feedback on their performance. As has been shown in comparison to other outcomes such as standardized patient performance, SEA does not appear to be a robust method for predicting resident performance in simulated clinical scenarios.

References

1. Ward M, Gruppen L, Regehr G. Measuring self-assessment: current state of the art. *Adv Health Sci Educ Theory Pract.* 2002;7(1):63-80.
2. Colliver JA, Verhulst SJ, Barrows HS. Self-assessment in medical practice: a further concern about the conventional research paradigm. *Teach Learn Med.* Summer 2005;17(3):200-201.

Table 1

Case	Pearson's r	r^2
Apnea	0.25 (p=0.23)	0.06
Asthma	**0.39 (p=0.04)**	0.15
Supraventricular Tachycardia	**0.39 (p=0.05)**	0.15
Septic Shock	0.06 (p=.76)	0.002

Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Lecturer/Speaker	Medical Education Technologies, Inc. (Viva Jo Siddall)

ABSTRACT # 1488
POSTER BOARD # 97

The Tumor: A Simulator for Open Surgery.

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Few simulation tools for practicing open surgical skills have been developed. We have built and tested a device that allows a learner to practice careful dissection, hemostasis, tying off blood vessels with suture in deep locations, and control of massive hemorrhage. The device is inexpensive, applicable to a wide range of surgical specialties, and can produce robust measurement of skills.

The Tumor is a device that represents a generic vascularized growth in a non-specific tissue medium. It is constructed of readily available materials and can be discarded after each use. The tumor model is constructed from a pluot (a cross between a plum and an apricot, approximately 5 cm in diameter) that has been pitted, frozen and thawed. Gelatin tinted with food coloring in a plastic food bowl represents the surrounding tissue. The pluot is imbedded in the gelatin so that 25% of the fruit is exposed. Four lengths of Silastic rubber (1.47 mm ID, 1.96 mm ID) tubing are threaded through the pluot to represent blood vessels. A fifth length of tubing of greater diameter is located under the core of the pluot to enable simulation of massive hemorrhage. Solenoid valves are used to control the pulsatile flow of red fluid from a pressure bag through the rubber blood vessels. The model must be refrigerated prior to use, but remains stable for approximately two hours at room temperature. Surgical exposure can be adjusted by cutting a hole in the cover of the food bowl to a desired size. At any time, the controller can produce bleeding from one of the minor or from the major blood vessel via the solenoid valves.

A learner is instructed to resect the tumor carefully using a limited set of basic surgical instruments so that the margin is maintained with as little damage to the tumor body and surrounding tissue as possible. The tumor is described as vascular, friable, and that bleeding may occur as it is manipulated. Blood vessels must be cut and tied with 3-0 silk sutures to keep blood loss to a minimum.

We have used the tumor model to engage surgeons during simulations centered on team training as a means to more closely replicate surgical tasks in the actual operating room. The nature of the model requires coordination with assistants and scrub nurses and also makes their jobs during simulation more realistic. The ability to create massive hemorrhage also allows for the creation of simulation scenarios based on the surgical field itself, a departure from scenarios that are often anesthesia based.

We hope to expand the use of the model in the future as a training device and possibly as a measure of surgical skill and judgment after validation studies to correlate surgical experience with technical performance on the model.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1490
POSTER BOARD # 52

Faculty Development for Simulation Based Education and Training Programmes. Can a national standard be created in the UK?.

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In the past 12-18 months there has been a significant increase in enthusiasm to explore the opportunities of simulation-based education and training in healthcare within the UK. This has been accelerated by the published experience of existing advanced simulation training facilities nationally and internationally, an ever increasing focus on patient-centred care along with requisite risk management and safety strategies, and more recently by the increased availability of affordable whole-body manikins from several international manufacturers.

As a result it seems worthy to consider whether this is an appropriate time to develop a project defining standards for the training of suitably skilled healthcare 'educators' who will be involved in the future development and delivery of simulation-based training across the UK. It will be important to make this project accessible and relevant to the broad range of undergraduate and postgraduate educators currently involved in simulation and clinical skills training as the distinction between these concepts is becoming increasingly blurred.

There are several components to consider within the project:
(a) Defining appropriate educational skills and techniques available (e.g. instructor, coach, facilitator) and recognising that some individuals will have experience of these attributes whilst others will need development.
(b) Identifying the spectrum of resources available to support simulation-based education (e.g. part-task trainer, whole body manikins, advanced simulator facilities, use of actors) and exploring how to co-ordinate and make best use of these resources.
(c) Describing the elements that support the development and delivery of a simulation-based educational programme, including course design, equipment familiarity, debrief and feedback skills, evaluating effectiveness.
(d) Clarifying the values to the individual of becoming involved in simulation-based education by providing evidence linking practice as an educator with professional development in the workplace.
(e) Contributing to the process demonstrating value of simulation-based education to the employer, both by training delivered to staff as well as providing the opportunity to link into risk management strategies.
(f) Working with employers and standard-setting organisations and institutions within healthcare and higher education to gain recognition and achieve consensus for such a standard to exist.

The next stage proposed for this project is to raise awareness of its profile both within the UK and abroad, gather opinion and support from all interested parties, and to consider how best to take forward its development and co-ordination.

Our presentation will summarise progress to date with the project in the UK, and identify the links made with other interested groups internationally who have had experience of persuing this type of concept. We will also present a mind-map which provides a visual representation of the issues involved and some of the potential key benefits that may be realised at an individual and organisational level.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1491
POSTER BOARD # 59

Development and Validation of High Fidelity Patient Simulator Case Scenarios for Pediatric Resident Evaluation.

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Background: Valid measurement instruments are necessary to assess residents' clinical competency. Evaluating the skills needed to care for seriously ill children is difficult given the rarity of serious childhood illness. Use of high-fidelity human patient simulation (HPS) systems allows this type of evaluation to be conducted efficiently.

Objective: To develop and validate a series of critical illness HPS case scenarios for pediatric resident evaluation.

Design/Methods: In this two year project, we developed four HPS-based case scenarios (CS). Each CS consisted of a script and an un-weighted checklist rating tool with 22-32 items. After initial CS creation, we conducted 80 testing scenarios over 11 months. This process allowed for the iterative revision of the script and checklist, removing or revising aspects that did not work in practice. In this first year, three raters completed checklists for each resident scenario; this also served as a training process for the raters. In the second year (Validation Phase), an equal number of first and second year residents completed two sessions each, for a total of 104 sessions. Feedback was provided at the end of each session. Reliability is reported for each checklist: Kappa (κ) and Brennan and Prediger's adjusted kappa[1] (κ_n) for inter-rater reliability and Cronbach's alpha for inter-item reliability (α). Global checklist scores are reported and mean scores for first and second year residents are compared for discriminative validity. Subject satisfaction and self-efficacy data were collected.

Results: Data are summarized in Table 1. For all of the scenarios except sepsis, there was a significant difference in scores between years. Inter-rater agreement values are moderate. All participants reported that they learned new information and that this experience will help with patient care. Significant errors were noted during evaluation including failing to ventilate an apneic child (62% of residents) and failing to check the serum glucose in an unconscious patient (73%).

Conclusions: Data derived from resident responses to our pediatric CS's have acceptable levels of inter-observer reliability and discriminative validity. The CSs were met with high levels of resident satisfaction. Clear gaps in knowledge were identified which will serve as a starting point for a future simulation-based educational intervention.

Reference

1. Brennan R, Prediger D. Coefficient Kappa: Some uses, Misuses and Alternatives. *Educ. Psych. Meas.* Fall 1981;41(3):687-699.

Table 1

Case Scenario	Overall Mean Score	1st Years	2nd Years	κ	κ_n	α
Asthma	67.1% (± 3.6%)	**61.9%**	**72.3%**	.77	.87	.52
Apnea	66.8% (± 3.8%)	**62.3%**	**71.3%**	.72	.83	.40
Supraventricular Tachycardia	66.5% (± 4.4%)	**61.0%**	**72.4%**	.55	.75	.54
Sepsis	68.7% (± 4.4%)	65.6%	71.6%	.62	.79	.62
Bold Entries - difference significant at $p < 0.05$						

Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Lecturer/Speaker	Medical Education Technologies, Inc (Viva Siddall)

ABSTRACT # 1493
POSTER BOARD # 53

The Current Role of Medical Simulation in American Urological Residency Training Programs.

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Introduction and Objective: A number of simulators have been recently introduced to develop surgical skills for urological residents. Current training involves traditional education techniques and the use of box trainers, but is largely subjective. To what extent and how surgical simulators are being utilized in training urology residents remains unknown. We evaluated the current status of simulator training in U.S. urological training programs.

Methods: The Accreditation Council for Graduate Medical Education recognizes 119 urology training programs across the United States. An anonymous questionnaire was developed and sent to each of the program directors. This survey consists of 15 questions that document the presence of various simulation methods and an additional 14 questions using a 5-step Likert scale (1=strongly disagree, 5=strongly agree) that disclosed their impact. The replies were analyzed for discrepancies, and the answers reported.

Results: Based on the initial survey distribution, thirty-seven (31%) questionnaires were returned. Access to a laparoscopy simulator was reported in 73% of the programs. While few programs use the laparoscopy simulator for testing (17%), most report the simulator is a good educational tool (85%) and realistic (69%). A low prevalence was reported for access to cystoscopy (15%), transurethral resection (6%), ureteroscopy (20%), or percutaneous access (11%) simulators. These trainers were noted to be educational, easy to use, and realistic. There was a mixed reaction regarding the educational value and ease of percutaneous access simulators. There was agreement between program directors that there is a role for simulator training (4.38, standard deviation= 0.681), that residents would willingly participate (4.19, sd= 0.701), and that simulators allow practice in a controlled environment (4.50, sd= 0.609) and allow defined teaching objectives (4.19, sd= 0.668). There was considerable disagreement on whether simulators are an adequate substitute for "hands-on instruction" (2.81, sd= 1.05), can be easily incorporated into the curriculum (2.65, sd= 1.21), have been validated (3.0, sd= 0.986), or will be needed for training in the era of the 80-hour work week (3.50, sd= 1.16).

Conclusions: Access to laparoscopic training devices for urology residents appears to be widespread, while access to other endoscopic simulators is minimal. Urology residency program directors recognize the educational value of simulators, although the extent to which they may be incorporated remains to be resolved.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1495
POSTER BOARD # 17

Perceptions of Experiencing Simulated Death.

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Objective
To obtain feedback from trainees completing medical simulation training programs regarding their opinion on experiencing a simulated death.

Methods
Retrospective analysis of quality assurance surveys inquiring about perceptions of simulated death. The sessions occurred between April and November 2004. A total of 63 physicians and 175 non-physician Air Medical Crew (AMC) paramedics and nurses participated.

Results
Survey data was received from 62 physicians (98%) and 162 AMC personnel (93%). Fifty-four physicians (32 residents (60%), 22 attendings (40%)) completed the survey.
One-hundred sixty-two AMC with 86 nurses (53%), and 67 paramedics (43%). Sixty-one AMC crew members (40%) and 33 physicians (61%) reported experiencing a simulated death. A Likert scale with 0 as strongly disagree and 4 as strongly agree was used.
Participants experiencing simulated death disagreed that simulated death impaired their ability to learn. Physicians reported with a median of 1 (Interquartile Range (IQR) :0-1), paramedics with a median of 0 (IQR:0-1) and nurses with a median of 1 (IQR:0-2). Physicians agreed that the simulated death likely correlated to actual patient death or severe injury with a median of 3 (IQR:2-3).
All agreed that they would expect the simulator to die if that was the likely outcome of the case with the physicians reporting a median of 3.5(IQR:3-4), paramedics with a median of 3(IQR:2-4) and nurses with a median of 3(IQR:2-4). They strongly disagreed that there would be a future reluctance to participate in simulation training because of a death. All reported a median of 0 (IQR:0-1). All participants strongly disagreed that simulated death is inappropriate regardless of the medical management reporting with a median of 0 (IQR:0-1).
All disagreed that death during simulation should be withheld from student training with physicians reporting a median of 1 (IQR:0-1), paramedics and nurses strongly disagreed and reported with a median of 0 (IQR:0-1). All participant disagreed that a separate disclosure of potential simulator death was needed with a median of 1 (IQR:0-2).

Conclusions
Participants did not find simulated death distracting to learning. Participants felt that students of their respective fields should be allowed to experience simulated death. No group felt that a separate disclosure of the possibility was needed.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1497
POSTER BOARD # 103

Applying Learning Object Principles To Simulation: The Anesthesia Machine Pre-Use Check.

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Introduction. Recent preliminary survey results indicate up to 80% non-compliance worldwide with the general recommendations to check an anesthesia machine before every case [1]. Lack of knowledge and inadequate instruction were among the most cited causes for non-compliance [1] suggesting a worldwide need for education and training, given the reported impact of the pre-use check and its documentation on patient safety [2].

Objectives. With Anesthesia Patient Safety Foundation funding, we set out to develop a free, transparent reality, web-disseminated simulation of the current US Food & Drug Administration (FDA) checklist (ca. 1993) that is reusable for (a) other national/regional checklists, (b) forthcoming new FDA recommendations, (c) different audiences (anesthesiologists, CRNAs, techs, vets) and (d) different machine designs, thus facilitating collaborative, efficient and fast deployment of e-learning.

Methods. To facilitate reuse, we applied learning object (LO) principles to simulation to create reusable simulation learning objects (SLO). A learning object (a) is reusable, (b) contains content, practice and assessment components and (c) is meta-tagged so that it can be intelligently identified by search algorithms to promote its reuse. A LO can consist of any kind of instruction format such as text, graphics, audio, video, multiple choice questions and simulations. In our definition of SLOs, implemented with Director (Macromedia, San Francisco, CA), we used only simulations and further subdivided the content, practice and assessment components into stand-alone simulations, individually invoked via unique URLs. The initial state of each simulated step in the FDA checklist is defined via a corresponding XML file. In the content SLOs ("see one"), users are taught how to perform a given test while simultaneously learning how to use the simulation; a "Rationale" button explains why each test is performed. An intelligent tutor provides tiered levels of assistance during practice SLOs ("do one"). In the assessment SLOs ("test oneself"), learners have to perform a procedure correctly and in the right sequence and then judge whether a randomly configured machine passes or fails a given test.

Results. The simulation of the US checklist at http://vam.anest.ufl.edu/learningobjects consists of 44 content, 45 practice, and 19 assessment SLOs. Casting the individual steps of the FDA checklist as SLOs and the text instructions as reconfigurable XML files more than doubled the time to implement the simulation. However, as a result, we were able to produce in an hour a simulation-enhanced version of the Australian and New Zealand College of Anaesthetists' checklist (at the above URL) via reuse of the SLOs created for the US checklist. Similarly, a Chinese version of the simulation is already available.

Discussion. Preliminary results are that our SLO approach has facilitated reusability and will provide finer granularity and control in reusability, sequencing and assessment. Our initial experience with display-based SLOs suggests that it may be worthwhile to investigate applying LO principles to physical simulator scenarios to facilitate sharing and consistency in providing content, practice and assessment via full-body simulation.

References:
1. Anesthesiology 103:A1195, 2005
2. Anesthesiology 102:257-68, 2005

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1498
POSTER BOARD # 71

Transparent Reality Simulation of Perioperative Hemostasis: Preliminary Development and Implementation.

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University of Florida, Department of Anesthesiology

Introduction: Classical models of hemostasis have failed to adequately explain in vivo observations of coagulation and coagulopathy, especially in the perioperative setting in which multiple complicated processes affect the final hemostatic outcome. A new conceptual model of hemostasis, the cell-based coagulation model, has supplanted the classical model because it elucidates these in vivo observations. Anesthesiologists play a central role in correcting perioperative coagulopathies as well as preventing abnormal thrombosis. Although simulations exist, none exist that specifically illustrate the complex, dynamic perioperative setting and no simulation allows users to see how their interventions effect hemostasis.

Objective: We propose the creation of a novel, interactive, internet-based simulation of perioperative coagulation to better educate all involved in the perioperative care of patients in current concepts of hemostasis, appropriate utilization and interpretation of coagulation tests and proper treatment of perioperative coagulopathy.
Methods: In keeping with the goal of simulating hemostasis in the perioperative setting, we focus on clinical aspects based on basic science. To facilitate understanding, we apply transparent reality simulation techniques that allow users to interact with the model of hemostasis and visualize the essential effects of their interventions on hemostasis within a surgical setting.

Results: As of this writing, the various concepts that have been explored for interactively simulating hemostasis can be viewed at http://vam.anest.ufl.edu/hemostasis. We will demonstrate our evolving work at the IMMS meeting in January 2006.

Discussion: Despite anesthesiologists' central role in perioperative hemostasis, we hypothesize anesthesiologists have a poor understanding of the current cell-based coagulation model, utility of coagulation tests and management of perioperative coagulopathy. This may lead to inaccurate interpretation of coagulation tests, over-utilization of certain treatments in lieu of more effective treatments and potentially suboptimal patient care. We hypothesize the use of an interactive, transparent, perioperative hemostasis simulator will increase anesthesiologists' appropriate utilization and interpretation of coagulation tests, institution of correct interventions and ultimately improvement of perioperative outcomes. Once our transparent reality simulator is complete, we will conduct a multi-institution study to test our hypothesis using anesthesiologists at various levels of experience. Questionnaires administered pre-intervention, immediately post-intervention and several months post-intervention will assess the effectiveness and retention of our education tool.

Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Grant support	Novo Nordisk

ABSTRACT # 1499
POSTER BOARD # 18

Progress on the Development of an ASA-sponsored National Anesthesiology Simulation CME Program.

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[1]ASA Committee on Outreach Education, [2]Workgroup on Simulation Education

Introduction. The American Society of Anesthesiologists (ASA) organized the Workgroup on Simulation Education under the Committee on Outreach Education, to determine interest, feasibility, and methods of developing an ASA-sponsored national (and perhaps standardized) anesthesiology simulation CME program.
Methods. The Workgroup (Dr's. Olympio (Chair), Barach, Bateman, Cole, Cooper, Gaba, Gravlee, Levine, Loyd, Quinlan, Ruskin, Schaefer, Steadman, Seropian, Sinz, Taekman, Torsher, Weinger, Wilks, and Janice Plack) conducted 12 conference calls and 2 meetings. Eight Goals were established to 1) create a web-based listing of simulation opportunities, 2) determine ASA-member interest in simulation and consider standardized course development, 3&4) develop an ASA process for approving high quality programs and instructors, 5) develop promotional schemes, 6) investigate provision of CME and measurement of outcomes, 7) develop a business plan, and 8) determine capability of centers to participate. Internet research and marketing, mass mailings, and administrative meetings were conducted.
Results. Known anesthesia simulation entities were identified and subsequently invited to participate in the newly developed ASA website registry (via www.asahq.org), which provides a searchable database of leadership, affiliation, URL, program description, equipment, resources, courses and availability of CME. Similarly, company names and types of equipment offered were listed for manufacturers. All anesthesia simulation entities are encouraged to participate. Additionally, centers were asked to complete an "ASA Survey of Simulation Centers", and asked to participate in a promotional "Simulation Saturday" on March 11, 2006. The survey probed for their interest in participating in the ASA CME project, length, time, and type of courses they offer, and numbers of instructors, participants, experience, and physical/administrative attributes of their centers. Response frequency is low at this time. Subsequently, a letter and "ASA Member Poll on Simulation CME" was mass-mailed to all active ASA members, generating over 1100 responses. Preliminary interpretation reveals only 22% had participated in simulation CME, (of which 94% indicated a positive experience). Of all respondents, 81% were interested in future simulation CME, with 60% favoring common events, 89% for rare events, 63% for teamwork skills, 81% for crisis resource management training, 53% for FOB but 79% for invasive airway management, 55% for TEE, 72% for regional anesthesia, 68% for ultrasound-guided CVC, 49% for multidisciplinary, 51% for videotaping, 71% for formal assessment. The highest percentage (83%) wanted local training. Only 2% said they were uncomfortable with, or not interested in simulation. "Simulation Expo", a live and dramatic video conference of an anesthesia crisis, was approved for ASA 2006. Extensive deliberations continue to focus upon methods for the ASA to promote and approve an enlarging subset of high-quality participating simulation centers and instructors.
Discussion. Results to date indicate that ASA-sponsored simulation education in anesthesiology is highly desired by its membership and enthusiastically supported by the ASA and its Workgroup. Further advertising and development among simulation centers is necessary to expand a high quality learning opportunity for ASA members.

Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Other	Chairman, ASA Workgroup on Simulation Education

ABSTRACT # 1500
POSTER BOARD # 19

Introducing a Pilot OB/GYN Residency Simulation Program.

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Background
A new simulation program has been introduced into the OB/GYN residency curriculum via a joint effort between the Center for Experiential Learning (CEL) and the OB/GYN department at the James H. Quillen College of Medicine, East Tennessee State University. This pilot program was designed with the long term goals of both education and resident assessment. Prior to the development of an assessment tool, simulation was first introduced as an educational component within the residency curriculum. Because simulation is novel to OB/GYN residency training, resident acceptance of simulation within the educational curriculum is crucial prior to full program implementation. To determine resident acceptance, post-exercise surveys were completed by the participants.

Methods
Cases were developed by CEL faculty based on learning objectives created by the OB/GYN faculty. Example cases used during this pilot program included ruptured ectopic pregnancy, malignant hyperthermia, ovarian hyperstimulation syndrome, hyperkalemia, mitral valve stenosis, neonatal resuscitation, and hyperthyroidism. All simulation and debriefing activities were carried out in the CEL using both CEL and OB/GYN faculty members. The CEL uses the METI HPS, Laerdal SimMan, Noelle, and other internally developed simulation equipment. One or two simulation cases were used during separate three hour simulation and debriefing sessions. Post-exercise surveys were conducted, to gauge resident acceptance. Survey items believed to indicate acceptance were as follows:
• The scenarios covered today were realistic.
• I learned information that I can directly apply to my clinical work/practice.
• Today's session will influence how I interact with patients.
• There is adequate opportunity to discuss communication and leadership components of the exercise during debriefing.
• I would like to return to the Center for similar exercises.

Results
The survey data show that all resident participants agreed or strongly agreed to the statements gauging resident acceptance.

Conclusions
Simulation as a curriculum component during residency is accepted by OB/GYN residents. This will allow for further development of the pilot program, introducing simulation as an assessment tool in the OB/GYN curriculum.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1501
POSTER BOARD # 20

Using Simulation to Teach Communication with Pediatric Patients and Their Families.

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Background: Effective, empathetic, and professional physician-patient communication and interaction are complex and difficult skills to learn. Training in these valuable skills is often inadequate in medical schools and residency programs. These essential skills of communication between physician and patient become imperative when dealing with pediatric patients and their families. We used a combination of standardized patient actors (SPs)and a pediatric human patient simulator (pHPS) to train anesthesiology residents appropriate communication skills. We also explored the rationale for family presence during medical procedures.

Material and Methods:
Senior anesthesiology residents (PGY-3,4) participated in 3 simulated scenarios designed to encourage reflection about how best to communicate with pediatric patients and their caregivers. Each scenario involved two different residents, while the remaining residents observered. Each scenario was followed by short debriefing.

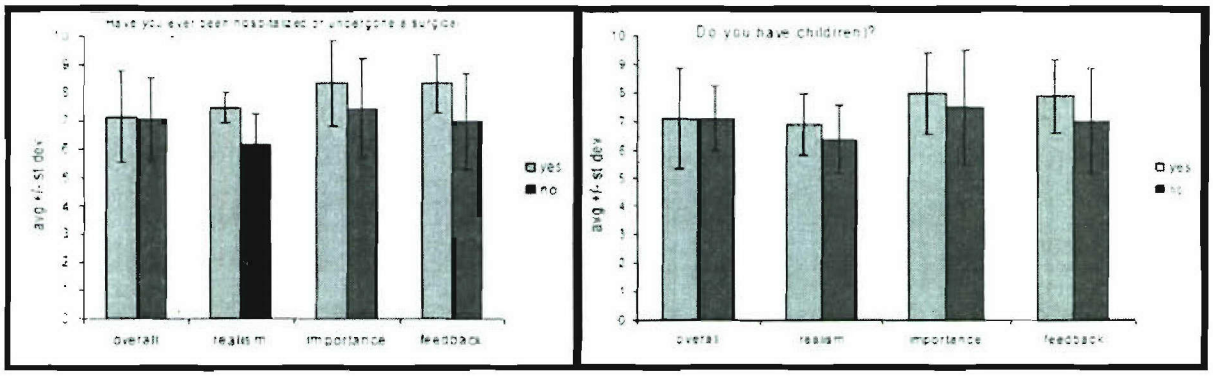
The first scenario was a routine encounter with a family in the preoperative area. The residents were expected to establish rapport, obtain a history and physical exam, answer questions, and obtain informed consent from the caregivers. Debriefing focused on communication and medical skills.

The second scenario utilized the pHPS as the same child now accompanied to the operating room by a parent (SP) for induction of anesthesia. A small crisis was created as the child developed laryngospasm and the parent became concerned. Debriefing focused on the interactions of the residents with the family during the crisis and then moved to a discussion of the rationale for family presence during medical interventions.

The third scenario focused on delivering bad news to parents (SPs.) The residents had to explain that a child in their care required multiple attempts at IV placement and now must remain intubated postoperatively due to an unexpected response to a drug they gave.
Finally the residents were asked to answer a short questionnaire about the session.

Results: The residents gave the exercise an overall rating of 7.1 +/-1.5. Table 1 compares the response of those who have personally encountered the medical system vs. those who have not yet. Interestingly, most of the residents who have children (47%) felt that this fact changed how they interact with other parents(71%.) Of residents who have had sick children, all said this experience had changed the way they now interact with other parents of sick children.

Conclusion: By combining the methods of both SPs and the pHPS we created a valuable and highly rated learning experience. The actors allowed the residents to practice and learn interpersonal communication skills and the pHPS allowed concurrent practice of crisis management skills.



Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1503
POSTER BOARD # 48

Civilian Medical Simulation Centers as a Regional Resource for Training and Skill Sustainment of Reserve Component Medical Personnel in Combat Casualty Care.

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Introduction: Reserve Component (Army National Guard and Reserve) medical personnel have limited training time and resources to maintain skills in mission essential tasks. Limited refresher materials and sustainment training are available through Web-based training. Advanced medical simulation (SIM) exercises at civilian simulation centers may be developed into a regional resource for improved Reserve Component (RC) personnel medical training.

Methods: RC military physicians and nurses experienced in treating combat casualties collaborated with civilian simulation center staff to develop a SIM-based training and refresher course for RC medical personnel. Simulation participants' input was used to continuously enhance the practical relevance of training exercises and to assess the feasibility of military medical training in a civilian simulation facility.

Results: A curriculum consisting of focused didactics, skill stations and SIM scenarios was constructed from combat experiences of RC personnel previously deployed in Afghanistan and Iraq. One four-patient and three single-patient cases exposed learners to high-velocity firearm injuries, landmine amputations, rocket-propelled grenade and improvised explosive device blast injuries, and vehicular blunt trauma. The multi-patient scenario required ethical decision-making and triage processing during the simultaneous care of friendly and enemy combatants. Two of six planned sessions, each scheduled to enroll at least ten RC personnel, have been completed. Feedback from participants has been rapidly incorporated and dynamically updated SIMs after completion of each session. Course development and logistic experience is being compiled to provide insight for future RC SIM implementations. Data acquisition on skills retention at short-term followup sessions and on the effect of learners' varying combat experience on clinical performance during SIMs is ongoing.

Conclusion: Civilian medical simulation centers close to RC medical units may offer a key solution to providing meaningful training experiences for soldiers otherwise unable to use similar Army resources at more distant locations.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1504
POSTER BOARD # 21

Use of a High Fidelity Pediatric Patient Simulator to Train Transport Personnel.

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[1]University of Wisconsin Children's Hospital, Division of Pediatric Critical Care Medicine, [2]Children's Hospital Emergency Transport Ambulance (CHETA)

INTRODUCTION: The recent establishment of an RN/RT pediatric transport team (CHETA) at the University of Wisconsin (UW) Children's Hospital prompted the development of a curriculum for training CHETA personnel for the transport of critically ill children. Although CHETA personnel are experienced in the care of critically ill children and all are staff in the pediatric intensive care unit, only 28% of the personnel had experience in inter-hospital transport of a critically ill patient. A training program was therefore developed with the goal of providing a realistic training environment for learning technical skills and medical protocols. Additionally, the program sought to develop the teamwork and communication skills which are necessary for a successful transport team.

METHODS: The human patient simulator laboratory (HPSL) at the UW Hospital was modified to simulate a referring hospital emergency room with a critically ill pediatric patient requiring inter-hospital transport.
A curriculum was developed to provide initial training for CHETA personnel in two three-hour sessions. The first training period emphasized proper technical skills including bag-valve-mask ventilation, endotracheal intubation, defibrillation/cardioversion, intraosseous line placement, and use of the laryngeal mask airway. The second training session was used to present medical scenarios simulating critically ill pediatric patients and emphasized familiarization with medical protocols and transport equipment. This session also stressed the development of communication skills and team building.
The trainees completed a pre and post-training survey that provided information about their level of experience in clinical and simulation environments. The survey also asked for a self-assessment of their cognitive and technical abilities. Self-assessment of the participants' skills and their evaluation of HPSL training was performed using a five-point Likert Scale (1-strongly disagree, 2-disagree, 3-neutral, 4-agree, 5-strongly agree)

RESULTS: Twenty-two CHETA personnel attended both training sessions (11 RNs, 11 RTs). Three others only attended the first session (3 RTs). Participants of the HPSL training reported improvement in their familiarity with use of transport equipment (3.4 pre vs 4.0 post)and felt more comfortable in their role as a member of the transport team (3.7 vs 4.2). CHETA team members reported improvement in their ability to perform all of the technical skills. Overall, the participants described the HPSL learning experience as one that prepared them for the transport of critically ill children (4.6) by improving procedural skills (4.5), defining team member roles (4.7), and by providing a realistic (4.5) and safe (4.8) training environment. Every participant felt HPSL training should be used in the training of medical personnel (5.0). Participants did not report an improvement in their ability to recognize and manage medical conditions or in their ability to use the transport ventilator.

CONCLUSION: High fidelity human patient simulation provides a safe and realistic training environment to aid personnel in preparing for the transport of critically ill children. Participants in the training became more familiar with their role as a transport team member and developed important procedural and communication skills during the training.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1505
POSTER BOARD # 104

All Aboard, Let's Go: How to Bring Your Coworkers to the Sim Side.

Mindi A. Anderson
University of Texas at Arlington School of Nursing

This poster will focus on practical strategies to facilitate others within an institution to adopt patient simulation as a teaching strategy. One of the underlying concepts of the Diffusion of Innovation Theory is that with any new technology, there are those who are innovators, those who are early adopters, those that are early majority adopters, those who are late majority adopters, and those that are late adopters (Rogers, 1983). This poster will discuss and display planning and implementation strategies on how to get individuals involved at different levels of readiness.

Examples of strategies highlighted will include: use of an institutional simulation newsletter where faculty can share their simulation success stories; simulation task force for tool and scenario design, along with simulation research planning and conduction; educational workshops for faculty; and a Gantt chart for simulation curriculum diffusion. Creative web interaction through supportive use of WebCT for faculty and a nursing in simulation resource website will be shown.

Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Other	Laerdal, Center of Excellence/Scenario Writing/Grant Funding

ABSTRACT # 1507
POSTER BOARD # 22

The Use of Blended Simulations In Medical Education.

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INTRODUCTION

Computer patient simulators, part-task trainers, and Standardized Patients (SP's) are predominate modalities used in teaching and assessing a learner's clinical competencies in medical education. While these have traditionally been used independently, there is increasing interest in integrating these two methods to teach and assess a broader range of skills. There have been discussions at recent conferences regarding the need to further the relationship between the medical simulation and standardized patient communities. With some evidence of the advantages of more realistic and broader simulation encounters and competing funding for the use of both modalities in medical education, dialogue between these two groups is vital. The authors will identify some current projects that blend the two technologies and provide resources for those interested in beginning collaborative projects.

PROJECT DESCRIPTION

A survey was sent to a list serve of Standardized Patient Educators to gather information on current or planned uses of standardized patients with other forms of simulation technologies. The survey asked participants to identify current uses of SP's with simulators. Additional information was then requested about each acknowledged use such as a brief description of the blended exercise, whether the exercise was used for teaching or assessment, the level of learner, and any research initiatives.

OUTCOMES

The results of the survey will be presented and examples given of the specific uses of blended simulations, current or proposed research, and contact information for those interested in dialogue.

CONCLUSION

Although there is indication that the integration of these methodologies is minimal, there is a need to identify the current uses and institutions that are using blended simulations to facilitate further development and research. The future of simulation education may likely take the path of integration and collaboration between the standardized patient and computerized simulation communities.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1508
POSTER BOARD # 67

Simulation Based Intervention as an Effective Teaching Tool for Teamwork and Pediatric Airway Skills.

Frank L Overly[1,2,3,4], Stephanie N Sudikoff[1,2,3,5], Marc J Shapiro[1,2,3]
[1]Brown Medical School, [2]Rhode Island Hospital/Hasbro Children's Hospital, [3]Department of Emergency Medicine, [4]Department Of Pediatrics, [5]Division of Critical Care

High fidelity medical simulation is an evolving tool, currently used by many institutions to teach medical students, residents, and other medical personnel. However, there is limited data on its efficacy as an educational intervention.

To evaluate high fidelity medical simulation as an educational intervention for teaching emergency pediatric management teamwork and airway skills, we performed a prospective, case control, observational study, using 16 PGY-2 pediatric residents. All subjects were PALS/APLS certified, and had no prior experience with medical simulation. Residents were given a brief intro to the sim center, and then managed 2 scenarios, during which their baseline airway and teamwork skills were assessed. The participants were divided into groups 1 and 2. Group 1 returned to the simulation center for a full-day, simulation enhanced session on pediatric airway management and teamwork skills. Two months later, groups 1 and 2 underwent reassessment of their performance. Following the second assessment, group 2 returned for the same educational intervention as group 1. Finally, both groups returned for a final assessment. During the assessment sessions, data were collected using the RIHMSC Global Competency Score (a Likert scale for subjective competency scoring), the Behaviorally Anchored Rating Scale (BARS), a previously validated teamwork metric (MedTeams™, Dynamic Research Corporation, Andover, MA), and critical action checklists specific for each scenario.

Results from the Global Competency Scores (range 1-7) and the BARS scores (range 1-7) are displayed below in tables 1($p<0.05$ for both RIHMCSGCS and BARS).

The results for successful intubation attempts, appropriate RSI, cricoid pressure and ETCO2 during the 96 total scenarios are also recorded in Table 1($p>0.05$ for all critical actions).

The global competency scores show a statistically significant correlation between the intervention and performance. The BARS scores improved with each session, although the educational intervention did not correlate with the improved performance. Critical actions show a trend of improvement. but this trend was not statistically significant. Our data support simulation as an effective tool for teaching teamwork skills and improving global competency in an emergency pediatric setting.

Table One

Session and Group	RIHMSC GCS	BARS	Succ Int Att	RSI (appr)	Cric Press	ETCO2
Session 1 Gr 1	3.7 (+/-0.15)	4.6(+/-0.19)	80%	50%	50%	56%
Session 2 Gr 1	5.5 (+/-0.14)	5.2(+/-0.19)	87%	87%	50%	44%
Session 3 Gr 1	6.3(+/-0.14)	5.4(+/-0.22)	89%	94%	73%	80%
Session 1 Gr 2	4.9(+/-0.14)	4.9(+/-0.21)	92%	81%	50%	13%
Session 2 Gr 2	4.1(+/-0.14)	5.3(+/-0.18)	77%	100%	69%	63%
Session 3 Gr 2	5.9(+/-0.14)	5.5(+/-0.19)	84%	100%	50%	81%

RIHMSC GCS=RIHMSC global competency scale, BARS=Behaviorally Anchored Rating Scale, Succ Int Att=successful intubation attempts, RSI(appr)= appropriate RSI, Cric Press = cricoid pressure, ETCO2=end tidal CO2 detector

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1509
POSTER BOARD # 54

TITLE: Developing a simulated environment for pediatric radiotherapy education

AUTHORS: David Wiljer, Normand Laperriere, Susan Awrey, Audrey Jusko Friedman, Heather Guscott, Erin Jones, Barbara.

David E Wiljer[1, 2], Normand Laperriere[1, 2], Susan Awrey[1], Audrey Jusko Friedman[1], Heather Guscott[1], Jones Erin[1], Barbara-Ann Millar[1, 2], Sharon McKinnon[1], Christa Surka[1], Pamela A Catton[1, 2]

[1]Princess Margaret Hospital/University Health Network, [2]University of Toronto

BACKGROUND: In pediatric radiation, educating patients and their families is a complex undertaking that poses many challenges. Immersive, simulated environments provide a unique opportunity for empowering patients so that they can become and engaged and active participants in their care. This presentation explores strategies for the development of a simulated educational environment for pediatric radiation patients and their parents. Radiation for Kids encourages learning and participation through a dynamic and realistic environment that is modeled on the actual treatment process. Children create their own character, meet their treatment team and explore treatment areas through realistic, age-appropriate isometric representations, interactive activities and informative animations.

MATERIALS AND METHODS: The iterative, four-stepped research process integrates several proven techniques: Step 1: Needs Assessment including an environmental scan and a literature review; Step 2: Concept and Design Document with content development, storyboard reviews, and semi-structured and "think aloud" interviews with patients; Step 3: Prototype Creation including the development of an interface, treatment simulations, interviews and usability tests; Step 4: Program Development including the production of all multimedia elements and usability testing.

RESULTS: Based on a thorough needs assessment that revealed the importance of interactivity, realistic environments, visual communication and frequent consultations with end users, content scope and user needs were identified and prioritized. A detailed development document was then presented to clinical educators (n=5) and patients (n=9) ranging in age from 4 to 13. A detailed, interactive prototype has been constructed and usability tests conducted with patients and parents (n=16). Participants are indicating that they prefer a realistic, detailed, warm and "healthy" environment so that they can identified and relate to their experience.

CONCLUSIONS: The evolution of this program reflects the importance of simulated, interactive environment for educating patients who are anxious and overwhelmed. The research has demonstrated the benefits of seeking continuous feedback from target audiences using a variety of techniques and the importance of a multidisciplinary approach. Preliminary results indicate that a realistic, simulated environment may help patients prepare for the experience of radiation therapy, but further research is ongoing to understand the optimal use of this approach.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1511
POSTER BOARD # 50

Value Of Virtual Reality Simulator In Assessing Laparoscopic Skills: Italian Experience Among Surgical Academic Institutions.

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Introduction
In the Surgical Schools the assessment of skill acquisition and actual technical competence has received poor if any objective attention. At least in the laparoscopic field the virtual reality simulators can help the educators in shortening learning curves in surgery and possibly predict future operating room performance. This is an experimental teaching project granted by the Italian University and Scientific Research Ministry (MIUR) carried on among four Surgical Departments in Padua, Verona, Pisa and Rome-Tor Vergata Universities

Material and methods
A LapSim virtual reality simulator (Surgical Science Ltd., Göteborg, Sweden) is being utilized during the current research program. The first step of the program was to enrol four training groups: 1) 4-5th year postgraduated surgical residents (number 30) with poor laparoscopic experience, 2) medical students with no experience at all (10), 3) well qualified surgeons with large experience in the laparoscopic field (10) 4) and non medical students with reported practice with video games as control group (10). All were first-time users of virtual reality simulator. They underwent several training sessions with only one final increase in difficulties. In the second step, surgical residents already trained and evaluated were send to perform a cholecystectomy in a well certified live animal laboratory (UCCS Center of CNR in San Piero a Grado, Pisa). Their technical skills in the porcine model were assessed by independent observers using a new scoring methods for assessing the operative errors

Results
During the first two sessions of training no statistical differences were found among the groups. Only later (from 3 to 6 attempts) experienced surgeon and successively the surgical residents appeared to be able to perform the basic tasks with less errors in a quicker time. Even so statistically significant evidences ($P < 0.05$) were reached in the more surgical specific manoeuvres such as clip applying and suturing. At the moment 12 residents were evaluated after performing cholecystectomy in the pig and were ranked by the blind observers according with number of operative errors as previously defined. The results were compared with the scores obtained in the simulator during the basic task sessions. The first data analysis shows a fair correlation between the results in the simulator with the score given in the surgical procedure (Pearson's coefficient = 0.715).

Conclusions
Virtual reality simulator appears a valid training and assessment tool of laparoscopic skills. However even the more experienced surgeon need time and exercise to acquire confidence with the new technology. Time and exercises number required to show statistical distance between novice subjects and experts as well as task difficulty are not yet well established. The skills acquired or showed in a virtual reality simulator seem to correlate with the ability to perform a real surgical procedure, even if more data are to be obtained.
The individual learning curves of surgeons beginning with laparoscopic tasks are to be well studied and understood in the view of adopting an effective virtual reality training program in the academic institutions and recommending the simulation technology in the general surgical education curriculum.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1512
POSTER BOARD # 23

The Use of Patient Simulators for Residency Competency Evaluation..

Jason Christensen[1], Paresh Patel[1], Carl Skinner[2]
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Background:
Evaluating clinical competency without jeopardizing patient safety is a challenge in residency education. Simulation Medicine is becoming a more integral part of Emergency Medicine residency education; however its effectiveness in assessing resident clinical skills for independent practice has not been validated.

Purpose:
We set out to demonstrate the effectiveness of simulation medicine in evaluating clinical competency.

Methods:
First through third year Emergency Medicine Residents at Darnall Army Community Hospital were given end of the year clinical evaluations by Staff Emergency Medicine physicians using patient simulators to evaluate basic Emergency Medicine care based on year of training. First,second and third year Emegency Medicine Residents were evaluated using patient simulators on basic Emegency Medicine care based on year of training. At the end of the simulation lab, 19 residents and 5 staff physicians were given confidential survey regarding how effective they felt the simulated patients were in evaluating clinical skills on a scale from 1-5 (1=poor, 2=fair, 3=good, 4=very good, and 5-excellent).

Results:
Staff Emergency Medicine physicians felt their evaluation of residents on simulated patients had good correlation with what they see on actual clinical shifts, with a mean survey score of 3.33. Residents also felt simulated patients were very good in evaluating their clinical skills, with a mean score of 4.05 (3.70-4.40, 95% confidence interval). Residents and staff both found the end of the year Simulation Day lab to be a fair way to evaluate clinical competency skills, with mean scores of 4.05 (3.82-4.29, 95% confidence interval) and 4.6, respectively.

Conclusion: Residents and staff feel patient simulators serve as a useful tool in end of year clinical evaluation of competency.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1514
POSTER BOARD # 40

Development Of A Simulation-Based Orientation To A Rural Medicine Immersion Experience: A Pilot Project.

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[1]University of Minnesota, [2]University of Minnesota, [3]University of Minnesota

Description: Simulations (using standardized patients, manikins, or a combination) can be used effectively with medical undergraduates as an alternative to lecture (see Gordon 2002). This paper describes the development, implementation, and outcomes using each of these simulation modalities in a 1-day orientation to prepare 30 3rd year medical students for 9-month clinical rotations in rural communities. Since so many of these students will work in under-resourced areas (and will, therefore, take a more active role in providing patient care), it was vital that the clinical content and the scenarios mirror the diversity of cases they are likely to encounter and assist students in evaluating and improving essential procedural skills.

Methods: The authors worked together to create educational objectives, write 8 clinically relevant cases, recruit and train standardized patients, recruit and orient clinical faculty, develop acute care algorithms for human patient simulators, adapt simulators for specific scenarios, and evaluate student outcomes using both quantitative and qualitative data. Thirty students (who applied for the rural physician training program) participated in the day-long orientation. Cases ranged from a pediatric URI to labor and delivery management and treatment of a post partum hemorrhage. Cases were clustered by the urgency of the chief complaint (i.e. primary care, acute care) with different amounts of time allotted for each clinical scenario (30 and 45 minutes respectively). Students were randomly divided into 8 teams. Each student completed a survey with perceptual, attitudinal, and self-evaluative items following completion of the primary care and acute care stations. Each student also participated in a verbal debriefing following the acute care stations and completed an evaluation of the orientation as a whole at the end of the day. Nine clinical faculty were also surveyed regarding their perceptions of student outcomes.

Results: Qualitative and quantitative data indicated that 1. students improved their confidence in preparation for their rural rotations; 2. students refreshed or gained new clinical skills in preparation for acute clinical situations; and 3. students felt that using this range of simulation modalities was an efficient and effective educational methodology that should be applied across the medical school curriculum. Results will be compared to evaluations 3 months into student rotations and again at the conclusion of the 9-month experience.

Conclusions: The combination of simulation methodologies was successful. The event will be repeated and evaluated similarly in the future. Longitudinal assessments will be used to revise the orientation and assist in ongoing development of the pre-clinical curriculum.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1515
POSTER BOARD # 24

Team Leaders Have A Narrowed Perception Of Communicative Team-Factors During Simulated Emergency Scenarios.

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[1]Department of Anaesthesia, University Hospital, Basel Switzerland, [2]Amsler Consulting, Biel-Benken Switzerland

Aim: To test, if there is a difference in the perception of medical and/or communicative factors between the team leader (L) and his assistant (A) during simulated emergency situations. Methods: 29 emergency physicians (EP) were each placed twice in the roles of L and A. Self assessment (SA) by standardized questionnaire after each simulation. Video-assisted objective assessment (OA) by two external observers using a previously validated check list. Interobserver reliability analyzed by intraclass correlation coefficient (ICC). Z-standardized values of the medical and communicative data analyzed by the Pearson correlation (r). Results: High interobserver reliability (ICC between 0.82 and 0.94). Positive correlation between medical and communicative behavior ($r = 0.52$/ $p<0.0001$). SA of A correlates significantly better than SA of L with objective assessed communicative/behavoral team factors (Table). Conclusions: Emergency physicians as team leaders do not show any correlation between SA and OA with regard to team factors. When Emergency physicians change their roles and work as assistants, SA and OA show significant correlations in three of six communicative factors. The best correlation is obtained by combining, the SAs of both, leader and assistant, which argues for investment in Crew Resource Management. Research agenda: To test whether good medical team performance is obtained by good communicative behavior or vice versa. To determine if there are other reasons that explain this excellent correlation.

	Medical performance	Time management	Delegation (L)	Communication (L→A)	Team cooperation	Overall communicative behavior
r (L)	0.34*	-	0.38***	-	-	-
r (A)	0.26**	0.50*	0.38***	0.45**	0.46**	0.45**
N	56-58		21-24			

Table: *$p<0.01$; **$p<0.05$; ***tendencies $p<0.10$ (only shown for smaller samples)

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1516
POSTER BOARD # 96

Training on the Virtual Reality Simulator CATHI Improves the Procedural Skills in Novices of Coronary Interventional Procedures- An Experimental Study Using a Pulsatile Coronary Flow Duplicator.

Wolfram G Voelker[1], Jan Coburger[1], Andreas Bonz[1], Martin Laser[1], Juergen Hesser[2]
[1]Department of Cardiology, Würzburg University, Würzburg, [2]Institute for Computational Medicine, Mannheim University, Mannheim, Germany

Progress in computer technology has promoted computer-based simulators. CATHI is a virtual simulator, which provides a realistic teaching environment for coronary interventions. It has a haptic interface to the original instruments and devices used in the cath-lab. CATHI produces a synthetic x-ray image of the coronary tree. We assessed the hypothesis that CATHI can improve the hand-eye coordination and total procedural quality of beginners performing coronary interventional procedures.

12 participants without any experience in interventional cardiology were randomized and underwent either simulation (Gr. 1: n=6) or pure computer based training with keyboard and mouse only (Gr. 2: n=6). Afterwards, each test-person had to perform a coronary intervention in a pulsatile flow model containing different target lesions. This procedure was performed in the cath-lab under fluoroscopic guidance. All steps of the intervention were objectively assessed according to a standardized form to determine a personal "skill-score" as a parameter of over-all procedural quality. The skills-score took different components into account, e.g. the usage of the X-ray-unit, the manipulation of the wire and the catheter, the risk-adapted behaviour and the amount of assistance, which was necessary during the procedure.

Simulator training (Gr. 1) resulted in a reduction of procedure and radiation time compared with computer based training (gr. 2); In contrast, the skill-score was significantly higher in group 1 than in gr. 2 (31.0 vs. 23.6; p=0.016). Training with the virtual simulator, CATHI, significantly improved the procedural skills of beginners. This may mainly be explained by the training effect itself, but also by the improved self-confidence, which the beginner gained by the simulator training. The teaching effect of CATHI in more experienced interventionalists has to be evaluated in further studies.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1519
POSTER BOARD # 82

Explicit Communication in an Obstetrical Emergency.

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Introduction: One of the hallmarks of a high-performance team is the use of a common language during emergency situations. In domains where formed teams are the typical organizational structure, clear conversation using common terms is especially important to avoid misunderstandings and to reduce the communication burden. We believe that labor and delivery teams might benefit from standardizing vocabulary during obstetrical emergencies. To understand the current vocabulary used we observed the declaration of a relatively common obstetrical emergency, shoulder dystocia, during a simulation exercise.

Methods: Obstetricians, labor nurses, and anesthesiologists participate in a simulation-based teamwork course at the Center for Medical Simulation on a weekly basis. All participants are post-graduate practitioners with a wide range of experience (6mo to >30yrs) from one of 14 different institutions. One of the case scenarios presented is an unanticipated shoulder dystocia using an apparatus we have described previously[1]. Investigators reviewed a sample of 12 videotapes randomized within institutions from a pool of 46 to document the vocabulary used in declaring the emergency. The obstetrical maneuvers that were used initially to relieve the shoulder dystocia were also recorded.

Results: The most common terminology used was: "shoulder dystocia" (33%), "we have a shoulder" (33%), "get a stool" (20%), and "it's stuck" (13%). All participants used the McRoberts maneuver and/or suprapubic pressure as their first maneuvers to manage the shoulder dystocia. There were no apparent misunderstandings between the team members that were observed.

Discussion: Although we saw no obvious sequela, we noted a variety of terms used to declare this critical event. During debriefings the most common reason cited by the obstetrician for not using the term "shoulder dystocia" was a desire not to alarm the patient and family. We remain concerned that the lack of a common terminology could result in misunderstanding and a delay in treatment during this critical event. We hope to develop a universal practice of declaring a shoulder dystocia by its technical name throughout our obstetrical practices.

[1] Walzer TB, Gardner R, Raemer DB. Obstetrical Emergency - an Apparatus to Simulate Shoulder Dystocia. Anesth Analg, 2004; 98 S39

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1520
POSTER BOARD # 94

Let's See What Happened: Development Of An Innovative Quad Screen Technology For Comprehensive Recording Of Interdisciplinary Team Training In A Virtual Operating Room Environment.

John T Paige[1], Valeriy V. Kozmenko[1], Thomas Frye[2], Barbara Morgan[1], David S Howel[1], Sheila Chauvin[1], Isidore Cohn[1], James P O'Leary[1], Charles W Hilton[1]
[1]LSU HSC, [2]Stryker

Introduction: The operating room (OR) is a fast paced, dynamic environment in which cohesive team function is essential for patient safety. Simulation based interdisciplinary team training is an attractive model for helping foster better teamwork because it allows group rehearsal in a low risk, yet realistic setting. One of the many challenges of such training is capturing pertinent data in a viewer friendly format for educational and evaluative uses. At Louisiana State University (LSU), we have developed a useful quad screen technology for viewing and recording the interdisciplinary team training sessions in crisis management that we conduct in our virtual operating room environment.

Methods: The simulated scenarios occur in a fully equipped minimally invasive OR suite that houses a computer operated mannequin and a virtual reality laparoscopic cholecystectomy machine. The interdisciplinary OR teams consist of a senior general surgery resident, a nurse anesthetist, and circulating nurse. Participants wear microphones, and the session is recorded. Output from the room camera, mannequin, and the virtual reality machine is routed through a mixer that reconstitutes it into a viewer friendly quad screen format. In this manner, the activity in the virtual OR, the mannequin's vital signs, and the progress of the virtual procedure itself are simultaneously projected onto a large viewing screen for teaching purposes. A recording of the quad screen is then used for debriefing and evaluation. A sample video will be shown.

Results: We have now conducted six sessions using the quad screen technology. It provides a viewer friendly format for projecting multiple events in the operating room environment. It is especially useful for illustrating salient points during a simulated scenario, both during the session and in the debriefing afterward. Technical issues include combining analog and digital output simultaneously on the screen.

Conclusion: We have successfully developed a quad screen technology for simultaneous viewing of events in a virtual operating room environment. Future plans include incorporating an events log within the quad.

Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Employee	Timothy Frye is a Stryker employee who helped in developing, installation and adjustment of the quad system

ABSTRACT # 1521
POSTER BOARD # 83

Complex Multiple Team Interactions During The Management Of Paediatric Emergencies: Use Of Advanced Simulation To Identify Team Development Needs.

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Prompt and appropriate management of any paediatric emergency in the hospital setting requires several factors to combine successfully within the context of extreme time pressure. When such a situation arises within the Emergency Department of a UK acute hospital, the immediate assessment and management plan will be initiated by the medical and nursing team present. The team leader will also initiate an urgent referral to the appropriate paediatric emergency admission team (usually medical, surgical, or critical care based), representatives of whom will then attend to review the patient and institute further management as deemed necessary.

After reviewing clinical incident summaries locally and nationally we became aware of a number of common themes that contributed to this process of care becoming compromised or to break down completely with significant implications for patient outcome. We decided to make use of an advanced patient simulation facility to explore these themes with experienced clinical teams from the acute hospital setting, and to discover if individuals or teams as a whole were able to identify any key development needs in order to prevent or minimize the risk of intra- or inter-team dysfunction when performing under stress.

Medical and nursing representatives of a paediatric Emergency Department team and a relevant paediatric admission team (ie critical care, surgical, or medical) were invited to attend the training day. The day comprised a series of scenarios in which attendees participated or observed their colleagues, followed immediately by video-enhanced feedback and group debriefing.

Several key themes were explored during the day, and were reinforced by means of faculty-led workshops interlaced between the scenarios. These themes included:
(a) Leadership and teamworking when two teams from separate backgrounds were in attendance, (b) Communication processes including handover of critical information within each team and between members of separate teams,
(c) Exploring the management of conflict of opinion and challenging decisions and priorities when the two teams were working alongside one another.

Key outcomes from each of these days to date have centred on the added value that the attending teams have identified for themselves over and above that which they have gained previously from different types of education and development training. Commonly thay have identified specific improvements necessary within their own working protocols and guidelines, and have expressed the desire to repeat the simulation training day to explore how best to implement any operational changes being considered. Another outcome has been identifying the need to recognize and acknowledge the experience and skills being brought to a critical situation by other staff, whilst not becoming disempowered by feeling uncomfortable about challenging decisions and priorities initiated by team leaders or other members.

An area of disappointment remains that despite having identified several crucial areas for personal and team development as a result of these training days, it has become difficult to develop the days further because there is not a history or culture for multiprofessional team training in the UK using this type of approach.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1522
POSTER BOARD # 77

An Immersive High-Fidelity Simulator Based Teaching For Anesthesiology Nursing Students Results In A Steady Improvement Of Performance In Trainees.

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Introduction: Operating room is a dynamic and fast paced environment that requires from medical personnel excellent theoretical knowledge, effective critical thinking and ability to work in stressful conditions. Immersion is a critical component in learning how to effectively function in OR. At Louisiana State University (LSU), we have developed an immersive high-fidelity simulator based context specific course for training anesthesia nursing students.

Methods: Teaching sessions occur in a fully equipped virtual OR. The following interactive scenarios comprise the course: simple intravenous induction into anesthesia, thermal injury with smoke inhalation, multiple trauma with tension pneumothorax and internal bleeding, intraoperative wheezing due to bronchial asthma exacerbation, intraoperative anaphylactic reaction, malignant hypothermia and intraoperative septic shock. Outcomes in these highly dynamic authentic scenarios depended on the students' ability to identify the problems and correctly prioritize the interventions. Literature review and our prior experience show that occasional exposure to the problem does not produce long lasting improvement in performance. To produce steady results, let the students to experience each case multiple times in alternating order slightly modifying the patients' descriptions. For each case we have developed case specific assessment check lists that were used to measure and monitor students' performances. The students worked on each case in random order as many times as was needed until they demonstrated a steady improvement in the patient's assessment, differential diagnosis and treatment. We followed each session with a guided debriefing during which the students reflected on their performances.

Results: As the course progressed, we observed several phenomena: developing of suspension of disbelief during the sessions, unbiased assessment of personal skills and knowledge, more effective management of the OR stress, demonstrating better competence in disintegrating complex problems into the smaller components, more effective prioritizing of objectives in a dynamic environment, shifting from external to internal gratification and demonstrating steady behavioral patterns resulting in the successful outcomes of simulated cases.

Conclusion: Multiple exposures to the authentic dynamic and highly interactive simulation cases in the immersive environment result in an improvement in clinicalreasoning and behaviors. Our future plans include expanding of the variety of cases.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1524
POSTER BOARD # 88

Consulting By Robot: Clinician-Patient Communication Via Mobile Telepresence

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Background:

Mobile telepresence via remotely-controlled robot offers innovative alternatives to traditional care. Senior clinicians can monitor patient progress at distant locations, providing advice to less experienced colleagues. Because the technology is so new, little is known about the skills required for remote presence (RP) consulting. The extensive literature on patient-centred communication during clinical interviews is based on face to face interactions. This study aims to develop and evaluate a communication guide for clinicians undertaking RP interactions. It is based on skills used in other patient encounters and draws on research into videoconferencing and media presentation skills.

Material and methods:

Six scenarios reflected a range of frequently encountered clinical conditions with a range of patient ages and characteristics (e.g. deaf, angry, insistent, reticent, unable to speak English and resistant to new technology), using simulated patients (trained actors) to present each role. Trainee surgeons used a remotely controlled RP6 mobile robot to consult with each patient in a simulated emergency department or surgical ward setting. A written guide to RP communication was evaluated, using a pre- and post-test design. Simulated patients rated their satisfaction after each encounter and identified helpful and unhelpful communication behaviors. Clinicians completed a post-test written evaluation to identify and prioritize communication skills for effective for patient-centered interactions.

Results: Five trainee surgeons each completed 6 clinical encounters (n=30). All found the communication guide helpful and perceived that it improved their skills. There were no significant differences between before and after scores based on simulated patients' ratings. However, responses to open-ended questions provided important feedback for development of the guide. Key areas include awareness of difficulties with RP communication, such as non-verbal communication (only the clinician's face is visible to the patient) and reduced access for clinicians to contextual cues (other ward activity, reduced visual field). A notable finding was the clinicians' perception that in the ward setting, RP enabled them to focus on the patient more easily since they were not distracted by other ward activities.

Conclusion: The study's primary outcome is a revised communication guide which has wide application in RP clinical interactions and possibly other areas of telemedicine. Full evaluation was not possible within this brief intervention, as any new skill set requires sustained deliberate practice and individual feedback. Future studies will evaluate the guide and consider ways in which more effective learning strategies can be incorporated.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1525
POSTER BOARD # 42

Computed Medical Simulation Program To Assess Final-Year-Residents' Clinical Decision Making Ability To Enhance Patient Safety In Japan.

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Introduction: There are demanding needs to create effective evaluation tools to assess Japanese final-year-residents' clinical skills in the end of two-year mandatory general clinical rotating training, which was newly and nationally introduced in Japan in 2004. Among variety of important clinical abilities that residents' need to develop by the end of the second year, it will come as a first priority to make accurate clinical decisions within limited time with consideration of patient safety. With ethical and financial consideration, introduction of computed medical simulation program can be feasible and beneficial.

Methods: Since January 2004, the committee for computed medical simulation program in the Department of Health Services Administration at Nippon Medical School, Tokyo, Japan, has been actively involved in creating a pilot medical simulation program to evaluate Japanese final-year-residents' clinical skills. The six members are consisted of three pediatric, gastrointestinal, and trauma surgeons, one internist, and one research student at the department. We chose three common medical symptoms which could cause serious medical outcomes; abdominal and chest pain, and headache. At this point, a computed simulation program with utilizing animation was created on abdominal pain, the others are in the process.

Results: The situation is at an exam room, and a graphically-drawn male patient sits in front the examinee, complaining of abdominal pain. An examinee can choose to conduct vital signs, physical exams, order labs, and fill in medical records. The monitor also shows pain level, given time (1,000 seconds, i.e., approximately 16 minutes), virtual time at the clinic. Guideline of the original scenario (diagnosis: gastric perforation) was created by the committee, based on the doctors' clinical experience. Variety of outcomes can be made by examinees' decision makings. The monitor would be ended automatically when the patient's pain level becomes maximum and/or virtual and/or given time end up. After completing the program, feedback is made according to outcomes verbally by the examiners.

Discussion and Conclusion: Advantages of this program are: 1. This program enables us to maintain the same examination quality each time; 2. Patient safety is guaranteed; 3. Updating the program is relatively easy, and the cost is lower than a manual exam. Our future steps are: 1. Completing to create the other two symptoms; 2. Discussion on feedback system to change from verbal feedback to programmed one; 3. Program evaluation to test its validity and reliability to apply to the residents.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1527
POSTER BOARD # 90

Remote Presence Support and Tutoring of Surgical Skills

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Background

Telemedicine support of non medical staff taking on extended roles is well documented but is limited by the immobility of 'static' telemedicine systems. New mobile technologies have the potential to allow a novel method of remote support to healthcare practitioners. The aim of the study was to evaluate the perceptions of students and their tutor as regards remote tutoring using a Remote Presence telemedicine robot (RP6) tutoring Perioperative Surgical Practitioners (PSPs) in surgical skills.

Methods

PSPs attended a structured, certificated course in skin ellipse excision and primary suture on a simulated bench top model in a skills centre. A surgical tutor provided group and individual tuition via the RP6, controlling the robot remotely from another site and 'visiting' each participant repeatedly during the session. Group teaching and individual tutoring were provided via the robot, while demonstration of key techniques using a software program ('Suture Tutor') was mediated by an assistant. Participants and tutor were interviewed using a semi-structured topic guide exploring perceptions of the session to evaluate the feasibility of remote presence tutoring. Interviews were audio recorded, transcribed verbatim and analysed by two researchers independently. Key themes were discussed within the research group

Results

Ten PSPs took part in the study. No impairment in the quality of teaching was reported, and the novelty of the robot was rapidly replaced by normal rapport with the tutor. Demonstration of the tasks and one to one tutoring was perceived as being satisfactory. Reduced non verbal cues from the tutor were noted as well as the need for clear verbal instruction. Technology dependent issues such as visual resolution, driving the robot and positioning of the tutor's face on the robot screen were potential areas for improvement. The tutor perceived that he was able to maintain good rapport with the participants and deliver effective teaching both individually and as a group.

Conclusions

Support and tutoring of surgical practitioners using mobile telemedicine robots is feasible and acceptable. Ideally groups should be small, and tutors should gain video conferencing communication skills. Effective remote tutoring may offer reduced travel time, cost savings for both practitioners and expert tutors, and potential for worldwide remote availability of experts.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1528
POSTER BOARD # 25

Individual Debriefing vs. Computer Based Multimedia Instruction After Patient Crisis Simulation.

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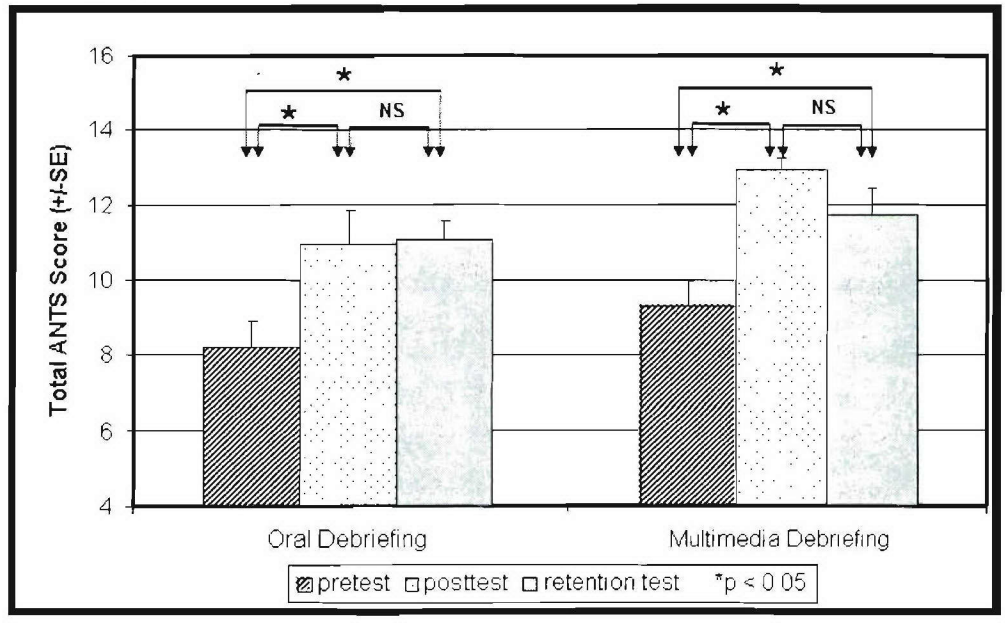
BACKGROUND: Several advantages of simulation over didactic and patient dependent teaching have lead to a proliferation of patient simulators in academic centers. Although simulation experience alone seems insufficient for learning, research evaluating different modes of instruction following simulation is lacking (1). Standardized multimedia has shown to be useful in teaching surgical skills, but has not been evaluated for use as an adjunct in crises management training. The primary purpose of this study is to determine whether standardized computer-based multimedia instruction is effective for learning in patient crises scenarios. The secondary purpose is to compare multimedia debriefing to personal oral debriefing with an expert.

METHODS: Thirty anesthesia residents were recruited to manage three different simulated resuscitation crises using a high-fidelity patient simulator. Following the first scenario, subjects were randomized to either a computer-based multimedia tutorial or a personal debriefing with an expert followed by a posttest and retention test five weeks later. To date, the performances of 20 residents were independently rated by two expert blinded assessors using the previously validated Anesthesia Non Technical Skills (ANTS) marking system (2).

RESULTS: Resident performance of non-technical skills improved significantly in both groups compared to pretest $p<0.05$). The improvement was sustained after five weeks for both groups ($p<0.05$)(see Figure). No significant difference in the performance of residents receiving either type of debriefing was demonstrated in any of the tests.

CONCLUSION: Computer based multimedia instruction is an effective method of teaching non-technical skills in simulated crisis scenarios and may be as effective as oral personalized debriefing. Multimedia may be a valuable adjunct to centers when debriefing expertise is not available. Multimedia may also improve simulation utilization by reducing anxiety of peer evaluation in continuing medical education.



(1) Savodelli GL et al., submitted 2005.
(2) Fletcher G et al., Br J Anaesth 2003; 90 (5) 580-588.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1529
POSTER BOARD # 62

Attending Anesthesiologist Responses to Resident Challenge: The Two-Challenge Rule.

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Introduction: In aviation, the "two-challenge rule" is a principle where a subordinate is obligated to challenge a superior when it's believed an unsafe action has been taken. If there is no answer, or a nonsensical answer, the subordinate is empowered to escalate the challenge and ultimately take control of the aircraft. A modified two-challenge rule for healthcare has been advocated in patient safety literature where "taking over" is replaced by "calling for help." In a prior simulation-based study, anesthesiology residents were reluctant to challenge questionable practices of an attending anesthesiologist. This follow-up study examines the responses of attending anesthesiologists to challenges made by residents.

Methods: In a simulated operating room, scripted residents challenge decisions made by an attending anesthesiologist (subject). The scenario is an elderly patient (70s) having an elective repair of a humerus fracture under interscalene block and general anesthesia. Relevant past medical history includes hypertension treated with hydrochlorothiazide. While the subject watches from a remote location, a confederate anesthesia team comprised of a simulator faculty attending and resident induce general anesthesia. There is disagreement about proceeding with the operation following discovery that the patient had a small amount of orange juice in the waiting area. After an uneventful rapid sequence induction, the attending is called to another room. The departing attending requests that the subject anesthesiologist supervise the resident described as "difficult to work with." The patient goes into rapid atrial fibrillation (HR ~ 150; SBP ~ 75). Using a structured technique based on the aviation two-challenge rule, the resident challenges medical decisions made by the subject.
Videotapes from ten scenarios were reviewed by a single investigator (RHB). Number and type of subject actions and subject response to the resident's challenge were noted. Subject response was coded to note if the challenge was acknowledged and whether an explanation was given. Acknowledgments were coded as "none," a "simple" verbal response, or "complex," meaning the subject acknowledged their management was being challenged. Additionally, the quality of an explanation for the action, or for rejecting the challenge, was coded as *adequate* or *inadequate*. The absence of an explanation was coded as *inadequate*.

Results: Of 10 cases evaluated, 45 challenges were identified (average 4.5 per case; range 2-8). Subjects' choice of therapy for atrial fibrillation was: medical 28/45 (62%), electrical 7/45 (16%), and other 10/45 (22%). 5/10 (50%) of the subjects requested and received help from another attending anesthesiologist. Subject responses to the resident challenges were: none 5/45 (11%), simple 30/45 (67%), and complex 10/45 (22%). The subjects' explanation to the resident was judged *adequate* 21/45 (47%) and <I/>inadequate 24/45 (53%).

Conclusions/Discussion: Anesthesiologists' responses to resident challenge demonstrated that over half of the challenges were not accompanied by an adequate explanation of the rationale behind the attending's decision-making. In the authors' opinions, these are lost learning opportunities for residents. Of greater concern is risk to patient safety when the resident suggestions are ignored or suppressed due to the position of authority of the attending.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1530
POSTER BOARD # 26

Integration Of Trauma Surgical Simulations In Terms Of An Osteosynthesis-Training And A Surgical Approach-Workshop In The Surgical Curriculum For Medical Students In Frankfurt.

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Background:
Student training in the trauma department takes place mainly in the emergency room and in the operating theater. In our experience, a large number of students seem to be overwhelmed with the complex duties in the OR especially with respect to the team, sterility and patient handling. Therefore, they are unable to focus on the actual operation itself.

Aims:
To give students the opportunity to participate in an advanced hands-on curriculum of trauma surgery techniques in the absence of the above mentioned distracting factors.

Design:
We first concentrated on the training of osteosynthesis techniques with artificial bones. In this setting, the students were able to gain extensive experience with the instruments, the different implants and their biomechanical characteristics. As a second step we combined these obtained procedural skills with anatomical knowledge performing a variety of surgical approaches and osteosynthesis using cryo-fixated corpses. Thereby the students had a chance to review the anatomical structures more intensively based on the surgical task. Using this training method, the students were able to build a basic knowledge for their future learning experiences in the operating theater setting.

Conclusion:
Simulations are a valid tool in trauma surgery education, since they allow students to concentrate on particular techniques or approaches. Artificial bone training followed by a simulation employing cryo-fixated corpses seem to represent adequate and logical substitutes to obtain advanced skills. This is necessary to ensure that learners have the opportunity to consolidate their knowledge in the complex clinical practice and especially in the operation theater. Using this new curriculum, we are able to offer students intensive hands-on training in trauma surgery in a very cost-efficient manner and to motivate them in the field of trauma surgery.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1531
POSTER BOARD # 60

Participants' 5-Month Outcomes After End-of-life Simulation Training Program.

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Introduction
Many pediatric healthcare professionals report being ill-equipped for difficult end-of life discussions. The Program to Enhance Relational and Communication Skills (PERCS) provides experiential learning opportunities for clinicians to sharpen their skills and reinforce their confidence in handling difficult situations with patients and their families. The intensive program creates realistic experiences utilizing high-fidelity simulation with professional actors. Participants review their videotaped experiences with fellow professionals and the PERCS learning team of medical, psychosocial and parent staff.

Methods
To evaluate the effectiveness of the PERCS program's immediate and 5-month outcomes, participants were given post-training and 5-month follow-up questionnaires.Post-training qualitative questions were:

What were the most helpful aspects of the training program?
Please reflect on what you may have learned and what you found to be most important in the session today and on any part of your professional and/or personal learning.

5-month follow-up questions were:
What do you remember learning in the PERCS program that has served you well in difficult discussions with patients and/or their families?
Have you made any changes in your clinical practice or professional life as a result of the PERCS program?

Participants' responses were read and coded into six thematic categories: Reflection on Own Practice, Value of Training Experience, Value of Practice, Confidence/Recognition Own, Team and Communication /Relational Skills Learned.

Results
One hundred and four trainees (mean age 34.0) including physicians (40%), nurses (43%), and psychosocial staff (17%), with varying degrees of experience, completed the post-training and 5-month follow-up questionnaires. PERCS participants reported gaining both immediate and long-term benefits. Most trainees reported that the aspects of the program they were most likely to remember and use in their clinical practice were those linked to specific communication and relational skills, for example, the ability to listen well, empathize, and better "communicate in an emotionally charged arena." After five months, participants reported significant retention of the knowledge they acquired in training and reported using this knowledge in clinical practice.

Conclusion
As a result of their training, participants reported immediate and long-term practical and clinical utility. PERCS trainees reported experiencing significant gains in communication and relational knowledge, specifically the acquisition of a strong skill set to draw upon in ongoing clinical situations and improved ability to handle difficult conversations involved in end-of-life care.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1532
POSTER BOARD # 55

Simulating Abdominal Surgery Using Common Household Items.

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Introduction:
The University of Louisville School of Medicine added a section to the Introduction to Clinical Medicine course called Interdisciplinary Clinical Cases (ICCs). The bi-weekly ICC sessions are small group sessions proctored by a clinical faculty member in which clinical cases are discussed with first and second year students. Recently, a new simulator-based session was added to the second year ICC curriculum. This session provided students with the opportunity to participate in a simulated exploratory abdominal surgery. The specific clinical case was that of a patient whose small intestine was acutely obstructed by an internal hernia requiring exploratory laparotomy.

Approach:
To provide this educational opportunity to students, simulated abdomens had to be designed and constructed, necessary supplies identified and obtained, and logistical issues worked out.

The simulated abdomens consisted of the abdominal cavity, organs and abdominal wall. The abdominal cavity was created using a plastic storage bin purchased at a discount store. Small intestines and mesentery were simulated using fabric and stuffing. The mesentery was sewn by hand to the base of the container. A small section of fabric with a small slit in the middle was attached to one corner of the bin to simulate the internal hernia. A knuckle of the "intestine" was pushed through the slit to represent the hernia. The bin was covered with an abdominal wall constructed of upholstery foam (fat) glued to fabric (skin) that was firmly tied down to the operating table.

In order to provide the simulated abdominal surgery experience to 150 second year students, we conducted 8 simultaneous 1-hour surgeries, with 6 or 7 students per abdomen. We repeated the session three times to accommodate all ICC groups. After gowning, gloving, and draping, students used scalpels and retractors to enter the abdomens. After exploring the abdominal contents, they reduced the hernia, examined the bowel, attempted to suture the hernia defect, and lastly closed the abdominal incision. Between sessions, the knuckle of intestine had to be re-inserted into the hernia defect and all abdominal walls replaced. Surgical supplies such as suture, gowns, gloves, and instruments were also prepared for the next group.

Conclusion:
This ICC session was a tremendous success. Students seemed genuinely engaged and excited, and their anecdotal comments were all positive. Upholstery foam and fabric simulated subcutaneous fat and skin fairly accurately, especially when incised with a scalpel. The girth and color of the small bowel could be altered as need to characterize almost any intra-abdominal pathology. Materials needed to create this surgical simulation exercise for all150 students cost less than $300 total.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1535
POSTER BOARD # 27

Development Of A Simulation Program To Teach Pediatric Resuscitation In An Emergency Medicine Residency Program.

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Introduction. Pediatric resuscitation is unique in many aspects from adult resuscitation, including the extreme rarity of occurrence as well as a strong emotional involvement by staff. The pressure and acuity of real situations make it difficult for adequate teaching to occur, and mistakes can have devastating consequences. Standardized life support courses have been developed to provide training and establish a minimum competency, however they fall short in providing realistic scenarios and it is difficult to measure resident retention of information and techniques. Studies have shown that residents are receptive to simulator based learning and this may represent the future of medical education. There is little research in the area of teaching pediatric resuscitation via a simulated environment. As residency programs strive to educate residents in the safest, most efficient, and most realistic way possible, we provide a description of innovative techniques in pediatric simulation.

Objective: To describe a new curriculum: Pediatric Emergency Simulation (Pedi-Sim) developed to teach the skills and knowledge presented in the standard American Heart Association Pediatric Advanced Life Support (PALS) course.

Methods: Incoming interns in an emergency medicine residency program participated in a one day Pedi-Sim course instead of the standard PALS course. The first three hours focused on basic knowledge and skill development. The remainder of the day consisted of high-fidelity case simulations focusing on key learning objectives in pediatric resuscitation. One resident led and one resident assisted in each case simulation while the others observed via real-time video. All residents participated in a guided debriefing session with video playback. Residents rated their experience on a horizontal numerical scale survey (1 = worst rating to 5 = best rating).

Results: Preliminary results show that the Pedi-Sim course was well-received by residents, with an overall rating of 4.9. The residents favorably rated Pedi-Sim in areas of critical thinking, development of behavioral skills, and the ability to transfer these skills to the real environment.

Conclusion. Interns participating in a Pedi-Sim course were enthusiastic about their experience. Knowledge assessment of key concepts via a traditional exam will be conducted. Perhaps a shift from traditional PALS to a simulation-based PALS for resident education in pediatric resuscitation may be warranted.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1536
POSTER BOARD # 28

Blending a Standardized Family Member with High-Fidelity Patient Simulation: An Integrated Approach to Teaching Breaking Bad News.

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Breaking bad news (BBN) compassionately is a vital skill that is expected of all physicians but it is generally not a focus of most training curricula. Our integrated approach to teaching BBN involves having the students break bad news to a standardized family member, immediately following active participation in an unsuccessful resuscitation on a high-fidelity human patient simulator.

Four standardized patients (SP) were trained to the resuscitation scenario used at the simulation center. One SP was trained to a fetal demise scenario that was used during a workshop in the classroom. Seventy-six third-year medical students were divided into two groups. All students completed a questionnaire prior to participation. Group 1 received little or no training prior to the resuscitation and breaking the bad news to the SP. Group 2 received a didactic lecture followed by small group sessions that allowed students to practice BBN. After the encounter, the students' completed a self-assessment of their ability to have a plan. They were also evaluated by the SP's using a likert scale on 21 items. Each group was debriefed by the clerkship director. Group1 received crossover training after their encounter.

Both groups were equal in terms of previous training and in the belief that the skill was important. Self-assessed ability to BBN and have a plan improved significantly over base line for both groups. Both rated the experience as extremely valuable and very realistic. The standardized patient wives' evaluation of the students showed significant improvement in key areas of effective BBN when compared to those that received little or no training. The students' experiences are being tracked longitudinally throughout the clerkship. This integrated approach was well received by the students and resulted in marked improvement of self-assessed skills and performance of students' ability to BBN.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1538
POSTER BOARD # 29

Simulation-based Parent-guided Project to Improve Disclosure of Unanticipated Outcomes.

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Background: The Joint Commission for Accreditation of Hospitals and Organizations, the American Medical Association, and the National Patient Safety Foundation all encourage disclosure of unanticipated outcomes to patients. This recommendation provides a unique challenge in pediatric hospitals where disclosure most often involves the patient's family. In reviewing incidents at our hospital, we found that better communication is needed between caregivers and patients' families in instances of real or perceived error. We developed a high fidelity, hands-on, simulation-based training program utilizing parent advisors to assist staff in communicating errors with empathy in order to maintain trust and create a truly healing experience.
Our challenge was to design a training program that effectively imparts the cognitive, technical and behavioral skills necessary when discussing the following situations with patients and families:
No error made, but harm occurs
Error made, no patient harm occurs
Error made, patient harm occurs.

Methods: Half day simulation-based training sessions were conducted for multidisciplinary teams from the oncology floor of a children's hospital. Teams of trainees consisting of a bedside nurse, charge nurse, physician, and social worker enter the simulator and interact with patients and families in one of three scenarios requiring disclosure of unanticipated outcomes. Members of a parent advisory council acted as parents in each scenario to provide a realistic experience for the trainees. Each scenario was videotaped and played back during debriefings facilitated by instructors experienced in simulation-based training and parent/actors.

Results: Prior to training, each trainee completed an objective assessment of their content knowledge of medical disclosure and a subjective assessment of their skill in and comfort with discussion of error with families; assessments were repeated after program completion. Information regarding communication and trust is being collected retrospectively from parents of patients who experienced a medical error in the 6 months prior to initiation of training; surveys will be repeated 6 months after initiation of this program.

Future: This program can be tailored to meet the needs of all pediatric inpatient settings. We will design unit-specific scenarios to best meet the training needs of our multidisciplinary staff and implement this program hospital wide on an annual basis.

Results	
Verisimilitude of the Simulation	
Room	3.6
Lighting	3.9
Acoustics	4.3
Mother role	4.8
Scenario Effectiveness	
How real	4.5
Verbal skills evoked	4.1
Nonverbal skills evoked	4.3
New skills used	4.6
Training Effectiveness	
Simulation	4.6
Mother	4.9
Debriefing	4.7
Overall	4.8
Disagree (0) to Agree (5)	

Conclusion: Given the lack of peer-reviewed literature on this topic, this program will define the standard for disclosure training by incorporating family members, multidisciplinary teams, and the use of simulation-based training to develop unit based SWAT teams for disclosure of unanticipated outcomes. This program can be tailored to meet the needs of all inpatient settings. Providing this training promotes trust between patients, their families, and healthcare professionals and acts to change the culture of blame currently present in medicine.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1539
POSTER BOARD # 72

Controlled Crossover Trial of Surgical Interactive Multimedia Module (SIMM) on Knowledge, Clinical Reasoning and Satisfaction.

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[1]Department of Surgery, NYU School of Medicine, [2]Department of Advanced Educational Systems, NYU School of Medicine

Background/rationale: Teaching in the surgical clerkship faces constraints as the breadth and depth of students' education is fragmented by changes in patient and physician exposure. These constraints drove the development of cutting edge multimedia education tools, as well as assessments to determine their impact on students' knowledge, clinical reasoning and satisfaction compared to the traditional clerkship curriculum.

What was done: The Surgical Interactive Multimedia Modules (SIMMs) are online, self-directed modules based on clinical encounters with hypothetical patients. Developed according to the best educational theory, they use multimedia, including 2D and 3D animation, video, and text, to illustrate surgery in a dynamic and clear fashion, appropriately model physician behavior, and highlight important principles concisely. We undertook a controlled, cross over study to assess the impact of the Carotid Disease SIMM on students' knowledge, clinical reasoning and satisfaction. Half of students were assigned to complete the SIMM in the first half of the clerkship and the rest were given access to it in the second half. All Students completed tests of knowledge and clinical reasoning (Script Concordance Test [SCT]) at the beginning, midpoint and end of the clerkship, and the intervention group completed a survey of their experience with the SIMM at the end of the clerkship.

Conclusions:
Early data based on four rotations of the surgery clerkship (n=93) show a trend toward improved knowledge (pre-post delta 28.38% intervention vs. 10.67% for control group p=0.2203, 95% CI -11.22,46.64). The data show an improvement in clinical reasoning for Symptomatic Carotid Disease (pre-post delta 32.5% vs. -3.13%, p=0.0521, 95% CI for the difference in deltas 2.06,69.19), the main content area of the SIMM, but not for related clinical areas (Recurring TIAS, Lower Extremity Disease, Asymptomatic Carotid Disease and Coronary Artery Disease). More than 80% of students felt the SIMM was superior to traditional teaching methods including lectures and surgery videos, and 81.8% strongly agreed that the SIMM enhanced their understanding of surgical technique and anatomy.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1540
POSTER BOARD # 34

Resident Performance Assessment Measured by Task Completion during an Obstetric Anesthetic Scenario on a High Fidelity Human Patient Simulator.

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Northwestern University Feinberg School of Medicine

Introduction: The ACGME has mandated that residency programs assess competency by developing tools that evaluate proficiency in specific areas. Although anesthesiologists must learn how to respond in emergencies, this competency is difficult to evaluate. Real emergencies are unusual and do not lend themselves to rigorous evaluation. The percentage of patients having Cesarean delivery under general anesthesia (GA) has decreased. In an effort to assess competency we have developed a scenario and a scoring system using a modified Delphi technique on a high fidelity human patient simulator of an emergency Cesarean delivery under GA. The purpose of this study was to compare the task completion rate between residents in their 1st and 3rd year of clinical anesthesia training.

Methods: A list of tasks relevant to performing an emergency cesarean delivery under GA was determined by a panel of 6 obstetric anesthesiologists with widespread US geographical representation and practice settings (1). The tasks were divided into four primary components parts: preoperative assessment, anesthesia setup and preparation, induction and intubation, and operative management. Sixteen resident anesthesiologists of different levels of training (8 CA-3 residents with extensive obstetric anesthesia experience, and 8 CA-1 residents with little or no such experience) were videotaped performing the simulation. Four attending anesthesiologists viewed and scored each of the 16 videotapes. To achieve task completion two of the four reviewers had to document performance. Overall task completion rate as well as the completion rate for each of the four component domains was compared between resident training levels using a χ^2 statistic. A $P < 0.05$ was required to reject the null hypothesis.

Results: The total number of observed tasks as well as those observed in each component of the simulation is shown in the table. CA-1 residents completed an average of 69 ± 6 percent of the 47 tasks compared to 79 ± 7 percent by the CA-3 residents. Individual tasks that demonstrated the greatest discrepancy between groups were airway evaluation (1/8 of the CA-1 group compared to 6/8 of the CA-3 group) and failure to reduce the inhalation anesthetic concentration following delivery (0/8 of the CA-1 group versus 8/8 of the CA-3 group).

Discussion: This study demonstrates that residency performance of an emergency cesarean delivery can be assessed by examination of task completion rates. In addition, identifying areas of greatest discrepancies can be used to structure education in performing critically important tasks for during emergency situations.

		Level of Training		
Component	# of tasks	CA-1	CA-3	P
Preoperative assessment	7	23/56	39/56	0.002
Anesthesia set-up and preparation	16	87/128	95/128	0.27
Induction and intubation	13	86/104	96/104	0.04
Operative management	11	63/88	72/88	0.10
Overall	47	259/376	302/376	0.003

Data presented as number of observed tasks/total observable tasks.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1543
POSTER BOARD # 37

Using Simulation To Promote Staff Education About Parent Presence At The Bedside During Invasive Procedures And Resuscitation.

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Introduction

The literature suggests that parents desire a choice regarding their presence during their child's procedures and resuscitation. Parent presence during procedures has been associated with improved parental adjustment and coping. Although parent presence during procedures is becoming increasingly prevalent in pediatric hospitals, there remains significant controversy and staff anxiety. Despite the trend toward greater parent involvement, there is a paucity of training opportunities to prepare clinicians. To address this deficiency, we used simulator technology to create educational videos demonstrating a hospital guideline, good communication, and role of the parent facilitator.

Methods

An interdisciplinary committee comprised of critical care physicians, nurses, and psychosocial staff collaborated to develop a hospital practice guideline for the cardiovascular and critical care programs regarding parent presence during procedures and resuscitation. A curriculum for critical care nurses was designed in three phases. Phase 1 included individualized in-services introducing the guideline and its components to nursing staff. Phase 2 provided in-depth review of the guideline and role of parent facilitator to leadership level nurses. Both Phases 1 and 2 incorporated video-taped simulated clinical scenarios using actors and patient simulators. Phase 3, which is currently in planning, will provide experiential learning opportunities using simulation for those that will serve as parent facilitators.

Results

Phase 1 of the curriculum was completed in three months. Illustrative video clips were included in the in-service presentation to highlight particular aspects of the guidelines including: gaining consensus among the team for a parent to be present for an invasive procedure or resuscitation; assessing the parents' preference to be present; and how to provide parents with the education and support needed to enable them to be a source of comfort to their infant/child during a procedure. Phase 2 was presented to all leadership level nurses during their annual retreat and included clips portraying: making the decision to acquire a parent facilitator to provide patients with a familiar source of support during a procedure; introducing the facilitator to the parent to show continuity of care and foster trust; and the importance of meeting with the parent after a procedure to ensure that all questions were answered. Several clips showcased the specific role of the facilitator: to be a constant presence for the family; allowing for silence; using touch; containing the anxiety and affect of the situation; gauging the amount of information that the parent wants to and is able to hear; and seeking more resources including psychosocial staff when the limits of the parents' tolerance had been reached.

Conclusion

We used simulation in a novel way to train a large population of nursing staff in a short period of time on a guideline surrounding parent presence during procedures and resuscitation. The presentations provided a framework to prepare nurses for parents' presence at the bedside during high-risk situations; videotaped simulations illustrated an approach toward achieving those objectives. We plan, in Phase 3, to directly engage chosen facilitators in high-fidelity simulation with parent actors to afford them opportunities to practice the components of the guidelines.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1544
POSTER BOARD # 73

The Effects of Simulation Use and Prior Experience on Trainee Knowledge Structure and Task Performance in Cardiopulmonary Emergency Medicine Training.

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This presentation reports findings of an ongoing research effort examining the role of prior training and work experience on changes in the knowledge structure of EMTs and Paramedics engaging in high fidelity simulation training on a variety of cardiopulmonary emergency medicine tasks (e.g. acute myocardial infarction, chest pain assessment, congestive heart failure, pulmonary edema). Differences between experts' and novices' domain specific knowledge structures have been well documented in the training literature and these structural differences have been linked to the ability of individuals and team members to perform complex tasks effectively. A critical feature of expertise and expert performance lies not just in the amount and type of information that a person holds, but in the organization of that knowledge and linkages between concepts representing the domain of expertise. Knowledge elicitation is a measurement technique designed to tap the conceptual organization of domain specific knowledge, and in this case, was used as 'high-resolution' instrument to asses learning outcomes of EMTs and Paramedics engaged in training on high fidelity mannequin patient simulators (i.e. SimMan® and SimBaby®).

The knowledge elicitation technique used in this study involved the collection of relatedness judgments from the trainees of concepts covered in the training program. The trainees completed a set of judgments immediately before and immediately after training sessions. These results were then compared to expert knowledge structures of the task domains (e.g. an "average" structure derived from knowledge elicitation administered to trainers). Mathematically, two measures of knowledge structure were calculated: (1) a measure of similarity between the trainees' knowledge structure and the expert structure, and (2) the internal coherence of each trainee's knowledge structure independent of comparison to the expert. In this way, the impact of specific aspects of the training and simulation characteristics could be assessed in terms of both objective task performance and alteration of the trainees' conceptual organization. Changes in the pre-training and post-training knowledge structures were then analyzed with respect to objective performance measures on the task as well as in relation to past training/work experience. The results of this research effort will contribute to the understanding of how simulation can be used to build expertise in emergency medicine practitioners as well as exploring the utility of knowledge elicitation as measurement technique for the purposes of diagnosis, remediation, and outcome assessment in medical training programs involving high fidelity simulation.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1545
POSTER BOARD # 68

Evaluation Of A Mobile 'In-Situ' Simulation Training Course For Teams (Paramedics And Doctors) In Wing-Based Emergency Air Rescue And Intensive Care Transport Using Subjective Pre-Post Competency Rati.

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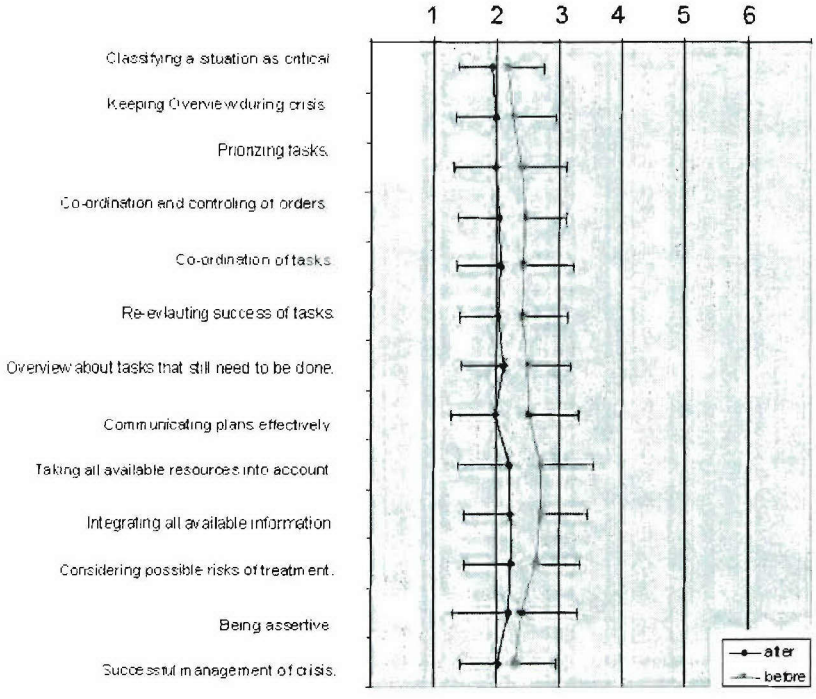
Background: Mobile "in-situ" simulation training could add a new dimension to the benefits of realistic scenarios. "In-situ" means that the training takes place in the real work place; the simulator instead of a patient. Especially in unusual clinical work places this form of training seems worth the extra effort of setting up the whole simulator and video-debriefing equipment. The teams of the German Air Rescue (DRF) studied here are mainly very experienced clinicians (paramedics and MDs). We evaluated our mobile in-situ trainings for the wing-based emergency service using subjective pre-post training competency ratings..

Method: The trainings were performed according to the "train where you work" principle in the Learjets of the DRF. The simulator (SimMan, Laerdal) and several video cameras and microphones were set up inside the jets including some heavy speakers for replaying the engine noises (90dB). A live transmission of a quad split view including vital signs was projected outside for the non-active trainees. 6 full day CRM-courses are evaluated with 66 participants altogether. After the course a questionnaire had to be filled in. Using a 6 point scale several competencies had to be rated a) judging your competency before the course (pre) and after the course (post, now). A paired t-test was used to judge significance.



Results: As shown in Figure 1 there is a trend to subjective improvement for all competencies. Especially for the competencies related to crisis resource management a slightly bigger improvement is demonstrated (Communicating plans effectively, Taking all available resources and information into account). Unfortunately the differences did not reach statistical significance, although for some competencies this was very close (p=0,065-0,09). In addition, during the in-situ trainings many problems of routine work (where is what etc) are discovered and can be solved

Conclusion: It is amazing to see that even very experienced teams do profit from the in-situ trainings. But also the provider DRF gets important information about how to improve their services. Although the logistical expenses should not be underestimated, for us, the in-situ trainings are the first choice and the peak of training for all unusual fields of care (emergency helicopter, ambulance, cath lab, CT scan etc) and experienced teams.

Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Honoraria	Laerdal Medical
Lecturer/Speaker	Laerdal Medical

ABSTRACT # 1547
POSTER BOARD # 16

The Harvard Summer PreMedical Institute: Fostering Biomedical Literacy through Patient Simulation

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Advanced biomedical science and technology are poised to fundamentally alter the human condition. Yet, because few high school or college students experience the true excitement of the field before choosing a career path, the available pool of professional intellectual capital is inherently limited.

Purpose: To introduce high school and college students to the "practice" of medicine using a high-fidelity patient simulator. We hypothesized that advanced instruction in basic and clinical science—typically unavailable to such students—could be intellectually transformative.

Methods: A group of educators at Harvard Medical School worked to design an intensive simulator-based curriculum for pre-medical students (one week for college students; the following week for high-school students). Classes were based at the Gilbert Simulation Labs on the medical school campus, each of which is outfitted with a full-body patient simulator, basic medical equipment, a conference table, and a web-based plasma screen. Students were selected from local schools based on institutional recommendations. The curriculum centered on seminal medical cases that served to animate the role of basic and clinical biomedical science in modern health care (chest pain, shortness of breath, abdominal pain, trauma, altered mental status). After an initial introduction to core medical concepts, the students were taught—and subsequently expected—to manage increasingly complex clinical cases (typically in teams of 5). All students were asked to provide a written evaluation of the course, and to keep a journal of their reflections.

Results: During 2 weeks in the summer of 2005, 11 college and 11 high-school students participated in the program. By the end of the course, both high-school and college students were able to take a standard history, perform a basic physical exam (including vital signs and cardiopulmonary auscultation), formulate a differential diagnosis, and evaluate various confirmatory tests (including chest x-rays, heart tracings, and basic labs). They learned the role of basic science in everyday clinical care, and came to understand the critical importance of effective communication with patients and colleagues. On the evaluation survey, 100% of the college students rated the course as "excellent" (highest on a 5-point scale), as did 78% of the high-school students (n=9 respondents). Of all students, 90% felt the experience was "much better" than prior educational experiences. Comments were overwhelmingly positive, including: "What started as simply 'class' transformed into the most enlightening week of my life"; "[it] was as though the lights have been turned on in a previously dark room"; "one of the best educational experiences I have ever had."

Conclusions: Biomedical science can be effectively animated for high-school and college students through patient simulation. Such an approach can foster intense interest in the life sciences at a formative age.

Acknowledgements: This program was funded by a grant from the Harvard University Office of the Provost. Special thanks to the HMS Office of Diversity and Community Partnerships for helping to select candidates; Wally Bethune, Angela Counts, and Rosemarie Meuse for their logistical support; and the BIDMC simulation lab for providing instruction in surgical technique.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1548
POSTER BOARD # 38

Integration of High-Fidelity Patient Simulation into a Traditional Pediatric Critical Care Curriculum: Trainees Perspective

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Introduction

According to adult learning theory, active involvement and reflection are of utmost importance for the transference of knowledge and skill. Unfortunately, opportunities for pediatric residents to gain experience with independent clinical decision-making are waning due to work hour restrictions, patient safety, and emerging expectations for attending-level care only. To provide greater hands-on experience for pediatric residents at our teaching hospital, we conducted a pilot study incorporating simulation-based teaching into a traditional pediatric critical care lecture curriculum.

Methods

A traditional lecture-based curriculum was adapted to include high-fidelity simulation. Seven modules, spanning two days each, were designed as a lecture complimented by an illustrative scenario. Teaching goals of each module included all aspects of patient care, from pathophysiology and history/physical taking to interpretation of tests and diagnoses. Over a 9-month period 37 pediatric trainees (PL2 and PL3) participated in beta-testing of the Airway Module. Day 1 was a 45-minute lecture covering respiratory support, airway equipment and induction/intubation regimens followed by (day 2) a simulation centered on the care of a 7-year-old child with a football injury resulting in respiratory distress complicated by elevated intracranial pressure. Objectives included identification of hypoxemia and respiratory failure, ability to select and use appropriate oxygen delivery systems, demonstration of proficiency with bag-and-mask ventilation, and eventual intubation using appropriate medications for a patient with increased ICP. In contrast to typical crisis-management training, sessions were specifically designed to move slowly, allowing trainees time to think and try different approaches to the clinical problem. To evaluate trainee experience, a post-questionnaire was administered which included Likert as well as two open-ended questions:

· What did you enjoy about or gain from the training session?
· Please reflect on what you may have learned and what you found to be most important in the training program.

Results

Qualitative analysis was conducted by two independent raters to identify the most important aspects of the training as viewed by the trainees themselves. Trainees identified these as: 1) having opportunity to practice with equipment; 2) a slow pace allowing for group discussion; 3) ability to make decisions without outside assistance; and 4) use of a "clinical pause" to ensure global understanding.

Conclusions

This pilot study demonstrates that hands-on learning in a simulator suite, following a traditional didactic session, enhanced trainees learning experience by providing an environment for active learning and reflection on the material. Trainees reported that (1) it was more important for them to have hands-on practice with basic airway equipment than to practice higher level thinking surrounding respiratory mechanics, (2) they enjoyed the slow pace of the simulator session, cooperatively making decisions with the results demonstrated in real-time, and (3) they enjoyed the "clinical pause" in the simulator session, which encouraged reflection and provided time to achieve understanding on the part of all participants. As a result of this pilot study, we plan to continue to incorporate simulation into the traditional curriculum. Future studies will compare traditional lecture based teaching with the simulation-enhanced curriculum.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1549
POSTER BOARD # 36

Evaluation of Behavior in the Delivery Room: Validation of a Scoring Tool.

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Background: Communication failures are the leading cause of inadvertent patient harm. The traditional Neonatal Resuscitation Program course is heavily weighted in cognitive and technical skill acquisition but ignores the behavioral skills necessary successfully manage neonatal emergencies. By evaluating these behavioral skills, it becomes possible to identify areas of weakness and strength. This information can be used to target training towards an individual's deficits. In order to evaluate these skills in simulated or real-time video performance, a valid and reliable tool is necessary.
Methods: 18 members of a resuscitation team reviewed two videos of simulated neonatal resuscitations in the delivery room. The personnel in each video were not familiar to any of the members of the resuscitation team. Performance of the lead physician was scored using a Likert Scale based instrument "Evaluation of Behavior in the Delivery Room"(EBDR). EBDR was created by experts in neonatal resuscitation and simulation-based training and is based on ten behavioral principles necessary for effective crisis management derived from the tenets of Crew Resorce Management (CRM). Data from the rating was analyzed using SPSS (Statistical Package for Social Sciences; SPSS, Chicago, IL, USA).
Results: Content validity ratios describing the completeness of the tool all equal 1 (>0.99 is considered valid). The accuracy between reference rater and rater scores for video one was 90.8% and for video 2 was 93.8%. The internal consistency as measured by Cronbach's alpha was 0.8331 for video 1 and 0.9168 for video 2.
Conclusion: The content validity, accuracy, and internal consistency of the EBDR were very high. The IRR was also acceptable at > than 0.6. The EBDR is a tool that effectively scores behavioral skills in the delivery room during neonatal resuscitation. This tool, with further refinement, has the potential to improve the effectiveness of training by targeting the teaching to an individual's need, thereby, improving the behavioral skills of the practitioner and ultimately leading to increased patient safety.

Conflict of Interest: Authors indicated they have nothing to disclose:

Results
Behavioral Skill Rwg Video 1 Rwg Video 2
Knowledge of the environment 0.7124 0.6780
Anticipating potential problems0.8823 0.6977
Assuming a leadership role 0.5163 0.5212
Communicating effectively 0.7516 0.5167
Delegating, distributing workload0.6144 0.6732
Focusing attention wisely 0.6470 0.5147
Using all available information 0.7908 0.7647
Using all available resources 0.5147 0.7647
Calling for help early enough 0.8105 0.4820
Maintains a professional demeanor0.4967 0.7500
Rwg=1-(S_2/_E2)

ABSTRACT # 1550
POSTER BOARD # 84

Development of a Transportable Modular Simulation-Based Patient Safety Curriculum for Graduate Medical Education.

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Brown Medical School, Rhode Island Hospital Medical Simulation Center

Background: Graduate medical education (GME) has traditionally placed limited attention on human factors training to promote patient safety. Human error has long been recognized as a significant component of error in both aviation and medicine. Despite this knowledge and national patient safety momentum most residency programs have not changed significantly, with the exception of the mandatory work hour restriction.
Objectives: 1) To create an introductory transportable simulation-based curriculum for resident education in human factors and patient safety. 2) To identify GME competency domains amenable to simulation-based assessment for multiple specialties. 3) To produce a simulation reference to assist the medical simulation community expand patient safety education.
Methods: This one year demonstration program funded by Centers for Medicare and Medicaid Services (CMS) was conducted at a regional simulation center and large tertiary care hospital. The modular curriculum design is flexible to allow for a broad patient safety education or focused intervention as determined by training priorities. Also, all modules have been linked to required ACGME competency requirements. A core characteristic of the project curriculum is its portability, which will permit medical educators to rapidly deploy its contents.
Conclusions: GME Education can incorporate patient safety and ACGME competencies into clinically relevant simulation scenarios. . Medical education should incorporate human factors training to foster cultural change and assist healthcare systems to become high reliability organizations.

Selected Simulation Modules			
Clinical content	Patient Safety Focus	Suggested ACGME competency	Selected Target Residents
Difficult airway	Cognitive errors	Practice-based learning + improvement	EM, IM, PEDs
High acuity trauma resuscitation	Teamwork	Systems-based practice	EM, Surg
Medication error with adverse outcome	Authority Gradient/Cultural change	Interpersonal + communication skills	ALL
Catastrophic patient deterioration in CT scan	Transitions in care	Systems-based practice	RADS, EM, IM
EM=Emergency Medicine, IM=Internal Medicine, PEDS=Pediatrics, RADS=Radiology Surg=General Surgery			

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1551
POSTER BOARD # 69

Performance of Crucial Resuscitation Maneuvers during Simulated Pediatric Cardiopulmonary Arrests: The Effect of an Educational Intervention.

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[1]Johns Hopkins School of Medicine, Department of Anesthesiology and Critical Care Medicine, [2]Johns Hopkins Simulation Center, [3]New York University, School of Continuing and Professional Studies

BACKGROUND: Outcomes from in-hospital pediatric cardiopulmonary arrest remain bleak with only ~ 24% of children surviving to one-year post-arrest. Timely initiation of basic and advanced life support is crucial to improving survival. Several studies have shown that pediatric residents feel uncomfortable in managing cardiopulmonary arrests, however there are few studies objectively assessing resident resuscitation skills.

OBJECTIVE: 1) Document the proportion of pediatric residents that successfully defibrillate a human patient simulator within 3 minutes of simulated pulseless ventricular tachycardia (VT). 2) Compare the proportion that do so pre and post-educational intervention.

METHODS: Prospective, before and after educational intervention study. In 2004, pediatric residents participated in individual mock codes at a tertiary care university using a high fidelity simulator. Each mock code included a standardized scenario of a conscious patient progressing to pulseless VT. Time to initiation of chest compressions, to the first defibrillation, and the proportion of residents successfully performing these maneuvers was evaluated. Following the 2004 sessions, deficiencies in resuscitation skills were identified. Monthly teaching sessions focused on leadership skills and timely initiation of ventilation, chest compressions and defibrillation were initiated. In 2005, the mock codes were repeated and the performance of the residents was compared pre and post educational intervention.

RESULTS: In 2004, 72/80 (90%) and in 2005, 60/80 (75%) of pediatric residents participated in these individual mock codes. Level of training was similarly distributed each year. In 2004, 21/72 of pediatric residents failed to initiate or direct a nurse to initiate compressions on the "pulseless patient" during the entire 15 minute scenario vs. 4/60 in 2005, (29% vs. 7%; $p = 0.002$). Of the 21 residents who never did compressions in 2004, 14/21 (67%) recognized the patient was pulseless but eventually defibrillated, 6/21 (28%) defibrillated prior to checking a pulse and 1/21 (5%) never checked a pulse, started compressions or defibrillated. The mean time [+/- standard error] elapsed between onset of pulseless VT and initiation of compressions (substituting 15 minutes for those that never initiated compressions) decreased significantly: (2004: 365 [+/- 45 seconds] vs. 2005: 154 [+/- 30 seconds], $p < 0.001$). More residents failed to defibrillate the mannequin within 3 minutes of pulseless VT the first year, (2004: 35/72 (49%) failed vs. 2005: 23/60 (38%); $p = 0.17$). In addition, more residents were never able to able to successfully defibrillate the mannequin the first year, (2004: 4/72 (6%) failed vs. 2005: 0/60 (0%); $p = 0.06$). The mean time elapsed until successful defibrillation of VT in 2004 was 267 [+/- 25 seconds] vs. 2005: 186 [+/- 14], $p = 0.006$.

CONCLUSION: At our institution, individual annual competency assessments were initiated in 2004. These mock codes revealed alarming deficiencies in resident resuscitation skills. Implementation of an educational intervention focused on identified deficiencies was associated with a higher likelihood of successfully performing crucial resuscitation maneuvers. Further research to determine whether improved ability to deliver high quality basic and advanced life support in a simulated setting translates to improved patient outcomes is warranted.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1552
POSTER BOARD # 56

Code Orange Simulator - Innovation in Emergency Preparedness Training for Health-care Providers.

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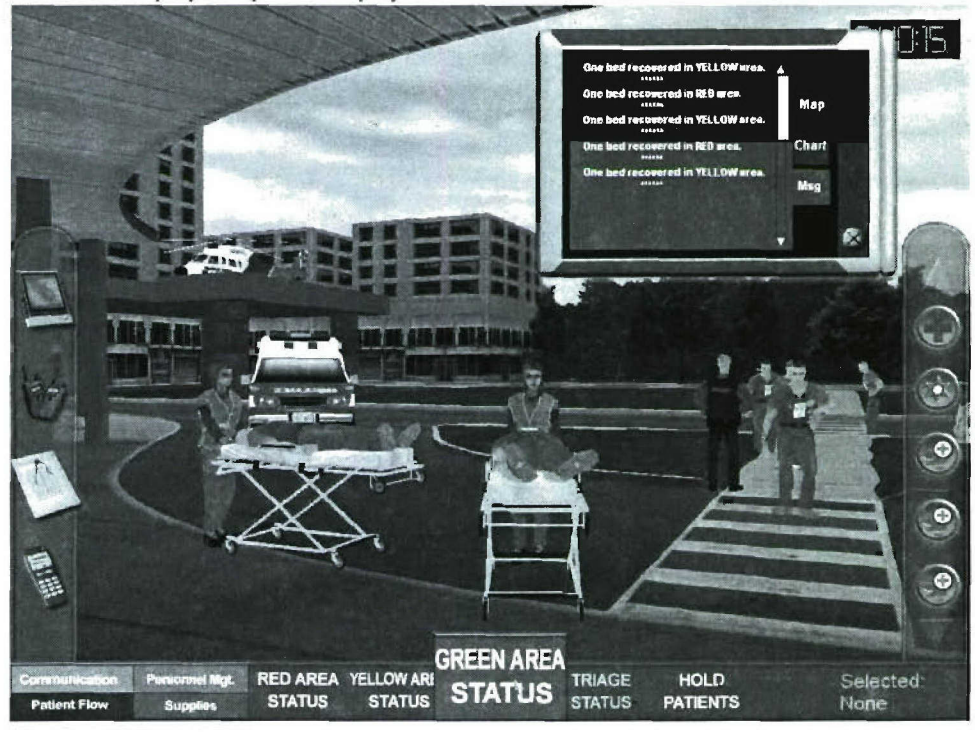
The Code Orange simulation is based within an Urban Hospital and presents the trainees with myriad crises there. The ranges of crises are everything from transit accidents, school shootings, hostage situations, chemical-biological attacks, to a major terrorist attack. The trainees are physicians, nurses, security, and hospital administrators who are required to practice their disaster management skill sets during a virtual crisis before they have to react in an actual MCI.

Graphic look: The simulation has a three-quarters top-down view which allows the player to see the environment from multiple angles. The trainees control their character and through the character avatar interacts with other people and the environment.

Training: The simulation requires the trainee to do the tasks that they would do during a crisis situation, e.g., evaluating the injuries of arriving patients, ordering tests, calling for a specialist, admitting a patient, and decontaminating a person or location. The player has to balance the needs of patients while projecting ahead to prepare for the scope and nature of the crisis. Players have to interact with the patients, the environment, and their co-workers in the simulation scenarios just as they would in an actual MCI. In addition, these scenarios are randomized as to the scope, magnitude, and timing of the MCI so that each time the trainee is presented with a specific crisis he must be prepared to be flexible in how he interacts with it.

Number of players: The simulation is multi-player capable and playable over the Internet. The simulation is playable stand-alone with results saved to a file for later input to the system. Many trainees are able to play the simulation across a local area network and over the Internet; interacting with each other and with AI controlled characters.



Time: Simulations is between 45 minutes and 1.5 hours. The time scale is adjustable to represent real-time at the slowest speed and 1/8 time at the fastest speed. This allows scenarios of up to 12 hours of simulation time which correspond to a max hospital shift.

Scoring system: At the end of each scenario trainees are graded on their performance according to how efficiently they adhered to the proper protocols. Virtually every action the trainee performs in the simulation results in some positive or negative change to his points score. The score is used only to measure the level of the trainee's success, relative to his standing vis a vis other trainees or himself. The protocols and scoring system are based on the work of subject matter experts in order to provide as objective and realistic a scoring system as possible. The scoring system interfaces with a Learning Management System (LMS) which allows follow-ups of the trainees' level as well as institutions and regional level of competency. An additional benefit of a seamless LMS is the ability of policy makers in the field of MCI management to evaluate gaps in their plan and based on gap analysis to improve their institution preparedness.

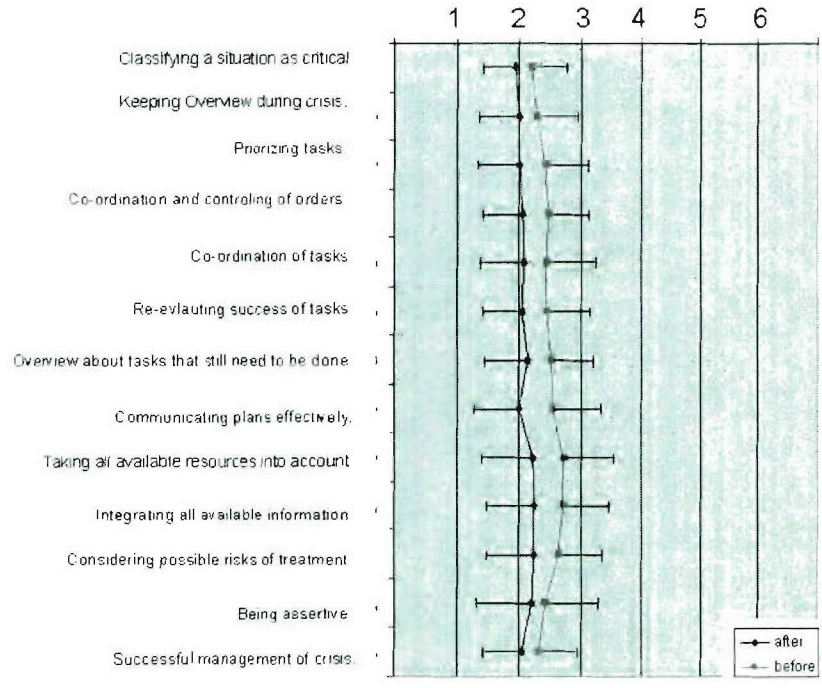
Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1553
POSTER BOARD # 44

Evaluation Of A Mobile "In-Situ" Simulation Training Course For Teams (Paramedics And Doctors) In Wing-Based Emergency Air Rescue And Intensive Care Using Subjective Pre-Post Competency Ratings.

Marcus Rall[1], Silke Reddersen[1], Eric Stricker[1], Joerg Zieger[1], Peter Dieckmann[1], Gerson Conrad[2]
[1]Center for Patient Safety and Simulation (TuPASS), Department of Anaesthesiology and Intensive Care, University Hospital Tuebingen, Tuebingen, Germany, [2]German Air Rescue, Filderstadt, Germany

Background: Mobile "in-situ" simulation training could add a new dimension to the benefits of realistic scenarios. "In-situ" means that the training takes place in the real work place; the simulator instead of a patient. Especially in unusual clinical work places this form of training seems worth the extra effort of setting up the whole simulator and video-debriefing equipment. The teams of the German Air Rescue (DRF) studied here are mainly very experienced clinicians (paramedics and MDs). We evaluated our mobile in-situ trainings for the wing-based emergency service using subjective pre-post training competency ratings.
Method: The trainings were performed according to the "train where you work" principle in the Learjets of the DRF. The simulator (SimMan, Laerdal) and several video cameras and microphones were set up inside the jets including some heavy speakers for replaying the engine noises (90dB). A live transmission of a quad split view including vital signs was projected outside for the non-active trainees. 6 full day CRM-courses are evaluated with 66 participants altogether. After the course a questionnaire had to be filled in. Using a 6 point scale several competencies had to be rated a) judging your competency before the course (pre) and after the course (post, now). A paired t-test was used to judge significance.
Results: As shown in Figure 1 there is a trend to subjective improvement for all competencies. Especially for the competencies related to crisis resource management a slightly bigger improvement is demonstrated (Communicating plans effectively, Taking all available resources and information into account). Unfortunately the differences did not reach statistical significance, although for some competencies this was very close (p=0,065-0,09). In addition, during the in-situ trainings many problems of routine work (where is what etc) are discovered and can be solved
Conclusion: It is amazing to see that even very experienced teams do profit from the in-situ trainings. But also the provider DRF gets important information about how to improve their services. Although the logistical expenses should not be underestimated, for us, the in-situ trainings are the first choice and the peak of training for all unusual fields of care (emergency helicopter, ambulance, cath lab, CT scan etc) and experienced teams.



Disclosure:

Affiliation/Financial Interest	***Name of Proprietary Entity*(ies)**
Lecturer/Speaker	SimuLearn Bologna, All Laerdal, Germany and Norway All

ABSTRACT # 1555
POSTER BOARD # 49

Optimizing Learning: Implications of Psychology for Simulation-Based Education.

Vicki R. LeBlanc[1, 2], Georges Savoldelli[1, 2], Stanley J. Hamstra[3]
[1]Wilson Centre, University of Toronto, [2]Patient Simulation Centre, St. Michael's Hospital, [3]Department of Medical Education, University of Michigan

Introduction:
During the clinical years of training, educators are often faced with the puzzling challenge that their trainees seem to have forgotten what they have learned in their pre-clinical years. Simulation-based educators also face the same challenge, in that the knowledge and skills learned during simulation-based sessions appear to decay over relatively short periods of time. The goal of this poster presentation is to introduce participants to basic principles of psychology that can optimize the retention and transfer of simulation-based learning to the clinical setting.

Specific Objectives:
Our poster presentation will outline how various psychological principles can provide answers to the following common questions from educators:

1. Why do trainees fail to recognize signs or problems that are seemingly obvious?
2. Why do the trainees forget information that they learned such a short while before?
3. Why do the trainees fail to recognize that a new problem requires the same solution as one seen such a short while before?

Materials and Methods:
In our poster, we will demonstrate how the manner in which information is presented to the trainees, how that information is linked to the trainees' prior knowledge, and how that information is practiced, will all have a significant impact of the trainees' learning and transfer of that learning to the clinical setting. Visitors to the poster will be taken through brief interactive examples to demonstrate the importance of the psychology principles. Furthermore, the poster presentation will outline simple means by which the discussed principles can be applied during simulation-based instruction.

Implications:
Visitors to the poster will gain a better understanding of basic psychological principles and their application to simulation based education. This should influence their teaching styles and education methods, as well as influence how they develop their simulation-based curriculum. As a result, the application of the psychological principles covered in this poster may result in the optimization of simulation-based learning and transfer to the clinical setting.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1556
POSTER BOARD # 45

Curriculum Innovation: The Three Pillars .

Paula Burns, Bill Brennan, Susan Dunington
The Michener Institute for Applied Health Sciences

The Michener Institute is Canada's only postsecondary institution dedicated exclusively to education for the applied health science professions. Michener's academic innovation strategy is focused on competency-based curriculum design, and leading edge education ensuring *Best Experience Best Education* for every learner. The compelling reasons for the redesign of health care education include: (1) concerns that the present medical education model is not sufficiently preparing graduates to ensure safe and effective practice, (2) potential compromise to the long-term ability of medical education delivery because of a limited number of clinical education sites, and (3) evidence that highlights the need for rigor in the assessment of competencies for health professions.

The Michener Institute has taken a unique approach to address the challenges in medical education. The Academic Innovation Strategy is supported by 3 pillars which include Interprofessional Education (IPE), simulation education, and competency assessment, including assessment of readiness for clinical education.

IPE is defined as "occasions when two or more professions learn together with the object of cultivating collaborative practice" (Barr, Freeth, Hammick, Koppel, & Reeves, 2000). New curriculum was developed to ensure graduate competency in interprofessionalism. Micheners' organizational structure, use of physical resources and organizational communication patterns were redesigned to emulate the foundation principles of IPE.

Simulation education provides a safe environment for learners to hone skills in communication critical thinking, crisis management, in addition to the profession-specific technical skills. Simulation provides learners with life situations where there is immediate feedback about decisions and actions in an environment tolerant of errors. By building on established simulation education expertise, Michener was able to reduce dependency on external clinical education sites.

Developing authentic assessment of clinical education preparedness is not well documented. Our strategy is to develop authentic assessment to ensure that learners are prepared for clinical practice. Authentic assessment requires real-world application of skills and knowledge that have meaning beyond the assessment activity (Archbald & Newmann, 1988).

Several important issues are raised and discussed in relation to the academic innovation strategy. What does an authentic assessment for readiness for clinical include? How much time is required for students to reach clinical competency? How does the curriculum design process support academic innovation? What are the research opportunities?

This poster will highlight the rationale for the innovative strategy introduced by Michener, describe the strategic plan and illustrate the leading-edge curriculum design that integrates IPE, simulation education and a readiness for clinical assessment

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1558
POSTER BOARD # 46

Simulator Teaching for A level school students with a career interest in Medicine.

Georgina A Martin, Girish dhond, Janet Wyner, Kevin Russell, Mervyn Maze
Simulation Centre, Chelsea & Westminster Hospital, London, UK

Introduction: This course was first designed by the Simulation centre at the Chelsea & Westminster Hospital in London, which gives the candidates a real insight into what being a doctor is all about. The course incorporates the simulation, resuscitation and clinical skills team as part of the faculty involving the expertise of Consultant Anaesthetists, resuscitation officers, ODP's and clinical skills nurses. The candidates are A level school students (aged 16 – 18 years old) with an interest in becoming a doctor and this course was designed to not only gives them an insight into what medicine is all about but also the opportunity to learn skills which they can take on to their future training in medicine.

The Course: 2 day course
1st day – Skills stations
1. Basic/Advanced Life Support training
2. Defibrillation training
3. Airway and Ventilation Training
4. Cannulation and venepuncture training
5. Drug administration and training – best practice
6. Lecture and Practice – How to take a patient history

2nd Day - complete Simulation based training.
The students have to put into practice the skills which they learn the day before. Before each scenario the students get a lecture on some medical condition which is then being simulated and after the scenario they are then debriefed on their performance which includes some non-technical skills.

The scenarios which the students under take are from basic airway management, trauma to cardiac arrests.

Finally the students receive an extremely informative lecture on tips for medical school interviews and are given a booklet on that topic.

Conclusion: Feedback form the course reveals the students feel that they have been given a real insight into what medicine is about and they feel that the teaching mode of simulation is excellent. The students feel that the course has reinforced their desire to be a doctor. They also feel that it prepared them for the medical school interviews and the skills and knowledge that they have learned will benefit them greatly in their future career.

The instructors feel that via the simulator-based learning they were able to compact a large amount of information to novices in a short time frame, while at the same time giving the students a flavour of life as a doctor.

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1560
POSTER BOARD # 99

A Novel Debriefing Tool: Online facilitator guidance package for debriefing team training using simulation.

Michael DeVita[1,2], John Lutz[1], Nicolette Mininni[1,2], Wendy Grbach[2]
[1]Winter Institute for Simulation Education and Research, University of Pittsburgh, [2]UPMC Health System

Crisis team training (also referred to a crisis resource management) focuses on helping ad hoc teams function together to attain group goals. Our program focuses on predetermined roles and role appropriate tasks, coupled with an objective set of performance measures within time limits. Consistency and quality of debriefing within a course is a difficult task when facilitators have to be experts in both debriefing techniques and the model of care. The need for highly trained, expert facilitators limits the ability to mass train. Creation of tools that enable a lower level trainer who can deliver the same quality of training would benefit quality, reliability, reproducibility and throughput of training centers.

To overcome this hurdle, we have developed a web-based, interactive facilitator website that includes:
1) a checklist of open ended debriefing questions to prompt instructors while debriefing students;
2) navigation tools (to "toggle" between videos, scoring sheets, performance graphs, citations, and the teaching slide set);
3) a library of "teaching points" which focus on the goal of each debriefing; and
4) a library of simulations with errors and appropriate behaviors highlighted to teach facilitators what to look for.

Our tool utilizes a checklist approach that allows competent (not expert) instructors to provide expert (not competent) debriefing by ensuring that they cover all teaching points, tasks, and ask questions during the debriefings. Each session debriefing has an overall goal (for example: role acquisition) and is subsequently divided into sections with central foci for each section. Instructors must check off each task and question acknowledging that they have been covered. The instructor cannot move on to the next section without having completed everything on the checklists. The web pages are designed in a way that they can be modified to be used with other courses taught at WISER

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1561
POSTER BOARD # 63

Learning with the Human Patient Simulator: Is it Necessary to be in the "Hot Seat"? A Pilot Study..

Sabrina Khoo[1], Gee-Mei Tan[2], Lian K Ti[1,2], Fun-Gee Chen[1,2]
[1]Yong Loo Lin School of Medicine, National University of Singapore, [2]National University Hospital, Singapore

Background
The Human Patient Simulator (HPS) confers the benefit of hands-on learning in addition to visual learning and active reinforcement inherent in small-group teaching. For this benefit, putting each student into the "hot-seat", i.e. to manage a scenario, has become the norm in HPS teaching. However, a recent study by Morgan et al questioned the merit of this exercise, as they found no advantage in using the HPS compared to tutor-facilitated video reviews for the teaching of medical students. We hypothesize that students gain the hands-on learning benefit only when they are in the hot-seat. In Morgan's study, students had hands-on for only a portion of each scenario, and were observers for the rest of the scenario, deriving no additional benefit compared to the video group. Therefore, we carried out a pilot study to investigate if students need to be in the hot-seat to fully benefit from HPS-based teaching.

Method
4th year medical students posted to anaesthesia were recruited and divided into groups of 4-6 students. Students were orientated to the manikin, monitors, drugs, and all equipment necessary for successful completion of the scenarios. Each student in turn was assigned a different scenario to manage, while the rest of the group watched via video-link. The scenarios were anaphylaxis, myocardial infarction, pulmonary embolism, tension pneumothorax, hypovolemic shock, and severe bronchospasm. Five learning objectives were emphasized, namely (1) crisis recognition; (2) basic management; (3) differential diagnosis; (4) specific management; and (5) correct drugs. A group debriefing was done at the end, facilitated by a tutor using videotaped recordings of the scenarios, paused at appropriate junctures to emphasize learning points, facilitate discussion, and answer questions. After a break, one of the scenarios taught earlier was randomly chosen as the test scenario. Each student was given 10 minutes to manage the scenario. The student who had managed the test scenario previously during the teaching session was considered to be in the hot-seat group, with the others as control. Marking was performed off-line by two blinded assessors, using mean scores as the final score.

Results
54 students participated in this study in 10 different groups, resulting in 10 students in the hot-seat group and 44 students in the control group. The students in the hot-seat group had better scores (72%±20% vs. 64%±17%; p=0.257). When their scores were ranked within individual groups, students in the hot-seat group had the highest score 40% of the time, and were ranked within the top two 70% of the time. This compares with the control group, who were ranked within the top two only 36% of the time (p=0.078). The hot-seat group had a median rank of 1 compared to a median rank of 4 in the control group. Inter-rater agreement was good (correlation = 0.824).

Conclusion
This study suggests that students in the hot-seat learn better than those observing, although the sample size was too small to be statistically significant. A bigger study is being carried out to confirm these findings.

Reference: Morgan et al. Anesthesiology 2002

Conflict of Interest: Authors indicated they have nothing to disclose:

ABSTRACT # 1562
POSTER BOARD # 70

Do Medical Students Learn and Retain the Skill of Endotracheal Intubation Better with Directed or Experiential Learning?.

Lian K Ti[1,2], Gee-Mei Tan[2], Sabrina Khoo[1], Fun-Gee Chen[1,2]
[1]Yong Loo Lin School of Medicine, National University of Singapore, [2]National University Hospital, Singapore

Background:
Endotracheal intubation is an important clinical skill that is difficult to learn and retain. The goal of this study is to improve the learning and retention of the taught skill of endotracheal intubation by medical students. We hypothesize that students will learn and remember how to perform this skill better when they are forced to experience the difficulties of self-directed (experiential) learning, compared to when they are guided from the start (the existing learning method).

Materials and Methods:
All fourth-year medical students posted to anesthesia were recruited and randomly assigned to one of two groups, to experience either directed or experiential learning. All students were initially taught a standard method of intubation using a video recording. Students in the directed group were then individually brought through intubation using the traditional step-by-step instruction technique by an experienced anesthesiologist on a manikin head. Students in the experiential group were left on their own to "sink-or-swim", in which the anesthesiologist took a back seat and allowed the student to figure out the correct technique of intubation; students were rescued after 10 minutes. Both groups had multiple opportunities to intubate the manikin head. The students were recalled 3 months later. Each student was individually tested on their intubation skill using a manikin head. Students were assessed on 4 major categories, namely (1) preparation of equipment; (2) correct intubation technique; (3) successful intubation and confirmation of placement, and (4) continued ventilation in between attempts. Their attempts were videotaped and analyzed off-line by two blinded investigators.

Results
36 students participated in the study, 17 in the directed group and 19 in the experiential group. 78% of the students in the experiential group successfully intubated the manikin, compared to 41% in the directed group ($p=0.039$). The experiential group also had higher overall scores ($82\% \pm 10\%$ vs. $72\% \pm 14\%$; $p=0.038$). The major difference between the groups was that the students in the experiential group were more likely to successfully intubate and correctly confirm placement of the tube. The inter-rater correlation was good (0.853).

Conclusion
Students were able to learn and retain the skill of endotracheal intubation significantly better with the experiential method of learning. This study suggests that adult or experiential learning should be adopted for the teaching of critical clinical skills such as endotracheal intubation.

Conflict of Interest: Authors indicated they have nothing to disclose:

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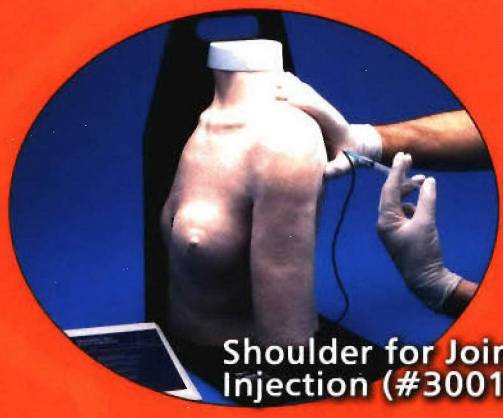

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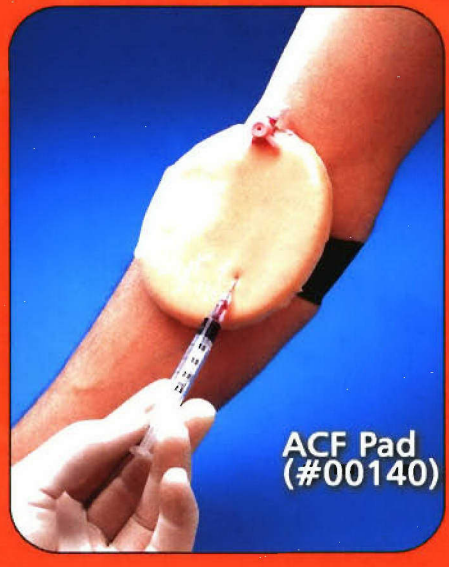

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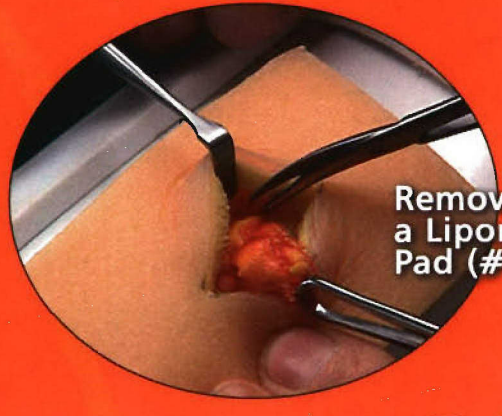

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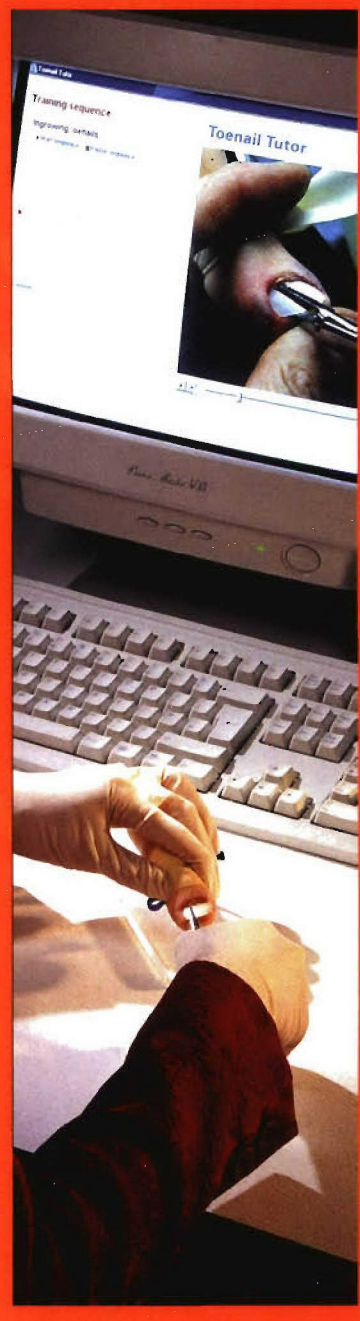

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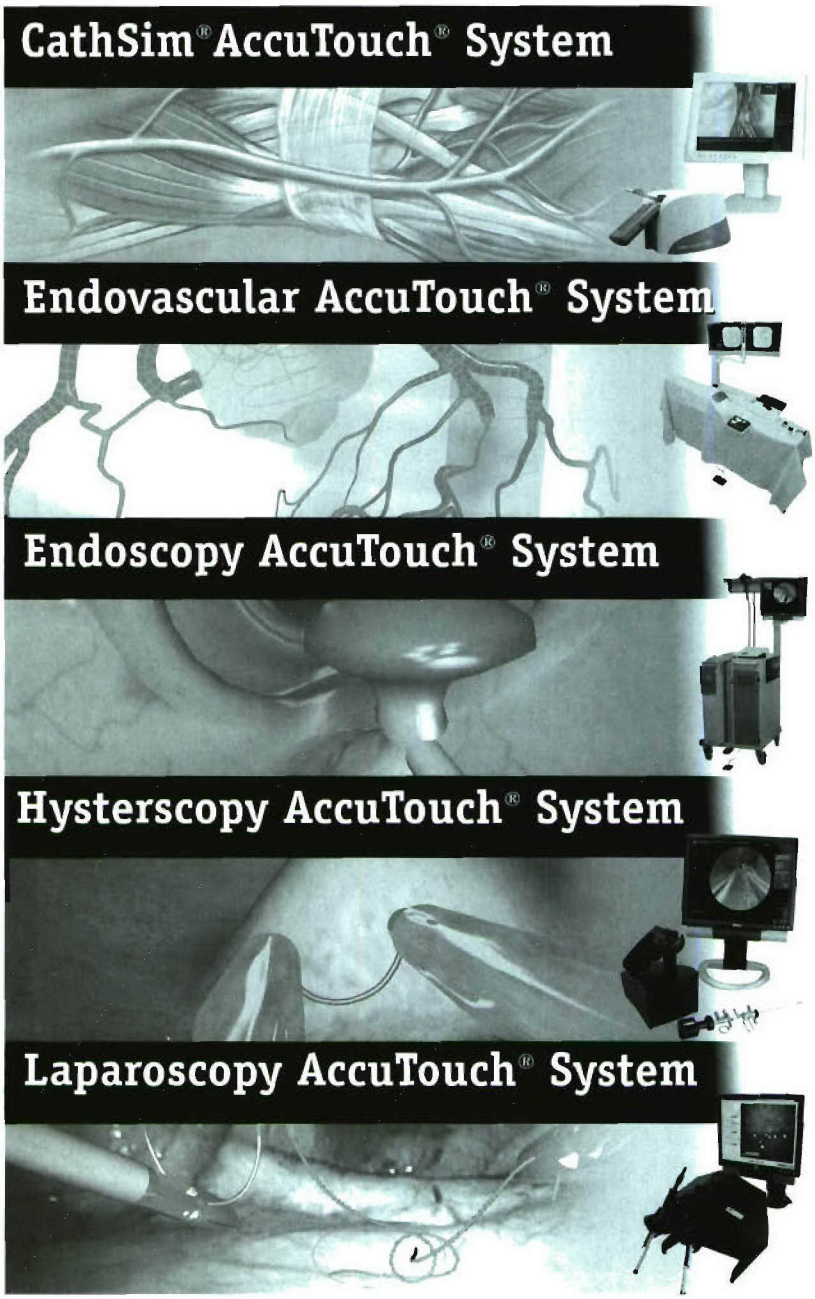

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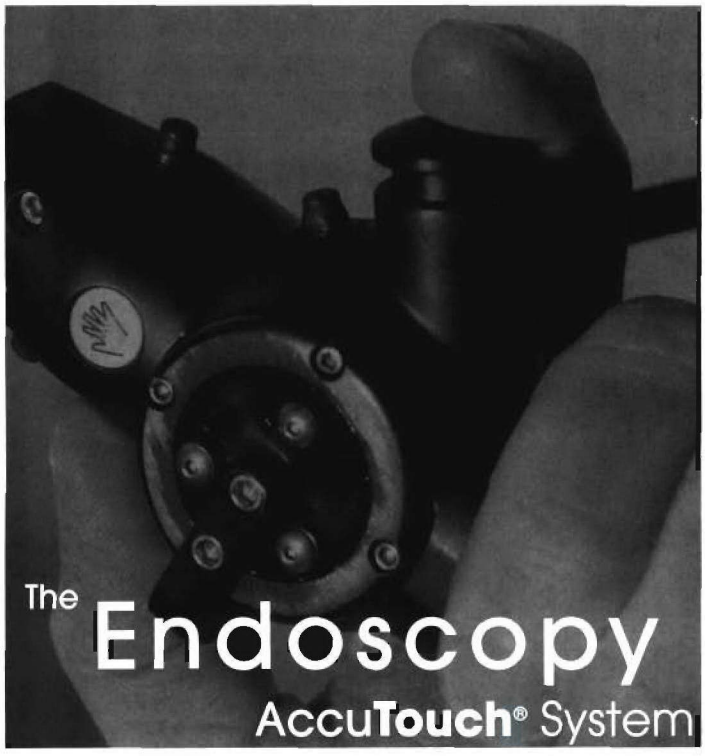

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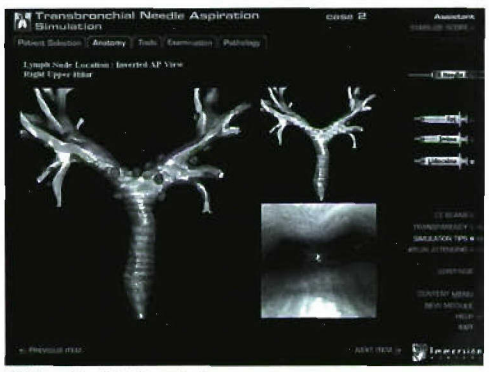

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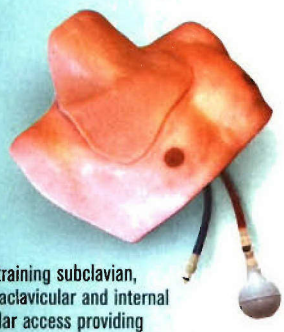

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A New Name

Dan Raemer, Ph.D. President, Society for Simulation in Healthcare

(*Simul Healthcare* 2006;1: 63–63)

The Society for Medical Simulation is changing its name to the ***Society for Simulation in Healthcare***. A name is an important entity—it defines one's identity, implies one's vision, and imprints an impression on all those who see and use it. But, changing a name is difficult as it can be confusing to those who have become familiar with the original name, and the change could be costly. Considering all the factors, the Board of Directors is pleased to have reached a landmark decision to change the name of the society at this relatively early stage of its existence. Aligning the name of the society with that already chosen for the journal establishes the identity of the society as a scientifically oriented organization. The new name is welcoming to all specialties, degree holders, and all forms of simulation; embodying an important part of the vision for this society. Additionally, *Society for Simulation in Healthcare* creates an impression, we believe, of leadership, breadth, and purpose that will serve us well into the future.

There are a number of changes that will be apparent this year. Beginning with 2007, the annual meeting will be known as the *International Meeting on Simulation in Healthcare*. You will begin to see our new logo as quickly as we can make the necessary changes on all sorts of material—the website, the cover of the journal, and other locations. Our new website address, **www.SSih.org**, is already active (although the old one will continue to work). Fortunately, we are minimalists in the use of paper, so changing our "letterhead" and other materials will not present much of a problem.

I, like others, are proud of the work already done under the aegis of the original name. But I like the new one much better! I especially like the message that it sends and hope that it will be part of a strong foundation that we are building for the development and use of simulation in healthcare.

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What's In a Name? A Mannequin by Any Other Name Would Work As Well

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(*Simul Healthcare* 2006;1: 64–65)

As the Society for Medical Simulation has now reached a landmark decision to change its name to match that of our Journal, soon to become the *Society for Simulation in Healthcare*, another set of name and word issues also arises for the Journal. That is, what to call the device used to replicate the patient's body? Those in the media seem fond of calling it a "dummy," especially when they can make a sly turn of phrase as in, "Doctors Learn from Smart Dummies." The inventors and designers of patient simulators prefer to think that "Dummies Learn from Smart Doctors." Still, this leaves us to contemplate other words to represent the patient simulation device.

Let me make this a bit of a personal story. Back in 1986 we conducted our first simulation with only a head and neck airway training device to represent the patient. Shortly thereafter we switched to a device that included a thorax as well as the head and neck—a device called "Eddie Endo" (whose manufacturer I have now forgotten). In our first paper[1] on simulation in *Anesthesiology*, we had to choose what to call the patient device. I honestly can't remember if Eddie Endo was described by its maker or seller as a "mannequin" (from French) or "manikin" (from Dutch) or in some other terms. I seem to recall that we knew of such a device in CPR training as (phonetically) a mănĭkĭn, but I don't remember ever seeing the name in writing in a medical context. In the U.S., the common term for a clothing display figure is "mannequin." Perhaps drawn by my years of study of the French language in high school we naturally submitted the paper to *Anesthesiology* with the French-originated spelling "mannequin." This was actually questioned by a reviewer, but I remember checking a handy dictionary that indicated the two spellings as equivalent. In those days, one couldn't easily check a dozen dictionaries from one's desktop, so we stayed with the French spelling.

Recently, as we formed the Journal, some members of the Editorial Board raised the question: Is it *mannequin* or *manikin*, and should the Journal require one or the other spelling to be standard. Nowadays, it is possible to check all sorts of things from one's desktop, so here are some facts related to this question.

- Both *mannequin* and *manikin* are listed as equivalent terms in many dictionaries, and some British dictionaries suggest that *mannequin* is a U.S. term or spelling for *manikin*. The most common meaning of *mannequin* is to describe a figure used to display clothing. In old-fashioned usage, this could be a human being (a model) or an inanimate object.
- *Manikin* originated from a Dutch term for "little man" (a dwarf). Besides being a different spelling for the clothing model, some dictionaries also listed definitions related to a wooden artist's model and to an anatomic model used for teaching in medicine. The

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Oxford English Dictionary gives the anatomic model definition as the third for *manikin* and traces this usage back to as early as 1831.[2]

- The original paper about the Sim One simulator produced at the University of Southern California in the late 1960s used the term *manikin*,[3] as did papers describing the cardiology simulator now known as "Harvey."[4] Other devices produced for resuscitation training have also traditionally been described as *manikins*.

This information, had it been more easily available in 1986–1988, might conceivably have led us to use the term *manikin*, and perhaps on to today, that would be that. However, as William S. Burroughs opined[5] and Laurie Anderson echoed,[6] "Language is a virus. . .," indicating that words, phrases, and ideas are constantly changing in meaning and usage. Thus, we need to look at the situation in 2006 for the usage of the terms *mannequin* and *manikin*. Just as the Internet now facilitates looking at multiple dictionaries and finding previous publications, it also facilitates counts of words and phrases in common use.

As of February 2006, the following facts were true:

- A Google search of "manikin" + "resuscitation" or + "CPR" gave 34,000 and 74,000 hits, respectively. When "mannequin" was substituted for "manikin," there were 23,000 and 49,000 hits, respectively. Obviously, in the context of resuscitation, *manikin* is the more common term.
- A Google search of "manikin" + "simulation" gave 40,000 hits, but "mannequin" + "simulation" gave 88,000 hits. When these searches used "medical simulation" rather than just "simulation," the results were 33,000 for "mannequin" and 21,000 for "manikin." Thus, in the context of simulation, *mannequin* is more common.
- A search of Index Medicus (ie, PubMed) showed 251 hits for "mannequin" and "simulation" and 233 hits for "manikin" and "simulation." Of these hits, 90% were in common, and the unique terms showed a slight advantage for *mannequin* over *manikin*.

Thus, when discussing simulation in healthcare, for whatever reason, *mannequin* has become the more common term, but considering the overall framework of simulation applications, the two terms can be considered more or less equivalent. Finally, a straw poll of attendees at the 2006 International Meeting on Medical Simulation revealed a small preference for *mannequin*, but most respondents considered the two terms essentially interchangeable.

Thus, based on this information, on opinions from the Editorial Board, and on the admitted bias of the Editor-in-Chief, *Simulation in Healthcare* is adopting the following policy:

- We recommend the term *mannequin* to be used to describe the physical device in a simulator that physically replicates the patient.
- We will accept the use of the term *manikin* if that is the authors' preference.
- The same term shall be used consistently throughout a paper, unless it is discussing historical or etymological issues requiring the use of the two different terms.

ANOTHER ETYMOLOGICAL ISSUE

Some authors are using the term *human patient simulator* to refer to the generic field of patient simulation for human beings. However, Human Patient Simulator is the trade name of a specific simulator product sold by Medical Education Technologies Incorporated (METI). As the Journal is about simulation in healthcare—clearly implying the care of human beings—there is no need to append "human" to the term *patient simulator* when meaning the generic device or the field as a whole. Should we publish papers on veterinary simulation, perhaps we will ask the authors to use the term *canine patient simulator* or the like. The term Human Patient Simulator is still appropriate when referring to specific characteristics of the METI product. The Instructions for Authors will publicize this policy and the copyediting staff will include it in the processing of papers accepted for publication.

Finally, in a light-hearted note, I find it fascinating that the study of words and word origins is *etymology*, whereas changing only a single letter converts the word to the study of insects, *entymology*. Indeed, what's in a name?

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Evaluation of a Framework for Case Development and Simulated Patient Training for Complex Procedures

Stephen A. Black, MRCS (Ed); Debra F. Nestel, BA, PhD; Emma J. Horrocks, BSc (Hons); Rachael H. Harrison, BSc (Hons); Norma Jones, MA; Cordula M. Wetzel, CMW; John H.N. Wolfe, FRCS, MS; Roger L. Kneebone, FRCS, MRCGP, PhD; and Ara W. Darzi, KBE, MD, FRCSI, FACS, FRCPSG, FMedSci

Background: Simulation for training and assessing clinicians is increasing but often overlooks the patient's perspective. In this paper, actors are trained to portray patients undergoing operations under local anesthetic within a high-fidelity simulated operating theater (SOT). There are few published accounts of approaches to case development and simulated patient (SP) training. We assess the feasibility of SPs playing complex surgical roles and evaluate a three-phased framework for case development and SP training.

Methods: We developed two patient roles for carotid endarterectomy (CEA) under local anesthesia. In all cases, the conscious patient interacted with the surgical team throughout the procedure. SPs were trained to simulate routine and crisis situations, using our framework. After consulting with each SP, surgeons "performed" a CEA upon a model attached to the SP. Evaluation of the framework used interviews, observations, and written evaluations with SPs, surgeons, and the project team. Descriptive statistics summarize surgeons' ratings of realism and qualitative data are analyzed thematically.

Results: In all, 46 simulations were conducted with 23 surgeons and three SPs. Real patient interview transcripts provided SPs with authentic information. The SP framework was easy to use, SP training was successful and surgeons' rated SP realism very highly. SPs valued guidance from the SOT control room using an audiolink.

Conclusions: Actors can be trained to portray patients undergoing complex procedures. Our framework for case development and SP training was effective in creating realistic roles. Future studies could evaluate this framework for additional procedures.

(*Simul Healthcare* 2006;1: 66–71)

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Simulation is likely to play an increasingly important part in health care training and assessment as clinicians' working hours are reduced, simulation technology improves, and patient safety and ethical imperatives limit "practice" on real patients. Simulated patients (SPs) are used extensively in medical education. Ker et al. (2005) describe the varied roles of SPs in the acquisition of communication, history-taking, physical examination, and other professional skills in health care.[1] Although widely used in teaching, SPs are also used in high stakes assessments. Here, SPs are required to perform a "standardized" role and often contribute to the rating of the candidate's performance.[2-8] Wind et al. (2004) described an instrument to assess SP performance.[9] Their validated scale is divided into two parts: authenticity and feedback. Although helpful, the instrument assesses the SP performance (during interview and feedback) rather than role construction and training. We hypothesize that these two factors strongly influence the realism of the performance, especially for complex roles. There are few published papers that document the case development and SP training process.

An increasing number of surgical operations and invasive investigations are carried out under local anesthetic. Such procedures require a combination of technical expertise with sensitivity to the patient's needs throughout the procedure. Our group at Imperial College London has pioneered an innovative combination of SPs with inanimate models and computer simulations to provide a safe yet authentic milieu for practice and assessment. Simple benchtop models or part task trainers are linked with actors, providing clinicians with an opportunity to develop clinical procedural skills in an authentic context.

Building on early work with simple suture pads attached to the arm of SPs, we have now explored scenario-based assessments in a wide range of procedural skills (eg, urinary catheterization, venipuncture, injections) and moved to more complex procedures involving virtual-reality simulators (eg, colonoscopy) and complex operations.[10-17]

Especially with complex surgical operations, authenticity demands considerable skill from each SP, and effective role training is essential. In this paper, we describe a framework for such training in the context of carotid endarterectomy (CEA).

CEA (the surgical removal of plaque from the carotid artery) reduces the risk of stroke in both symptomatic and asymptomatic patients and is a key procedure within vascular surgery. To minimize the risk of intraoperative stroke, the procedure is sometimes carried out under local anesthesia. This allows the surgical team to interact with the patient throughout the operation, detect early signs of neurologic impairment and respond appropriately (eg, by inserting a shunt to restore cerebral blood flow).[18-22] This requires active and effective interaction between the surgeon, anesthesia professional, and patient. Using a high-fidelity simulated operating theater (SOT), we recreate CEA procedures in which surgical, anesthetic, and nursing team members work together with an SP.

The aim of this paper is to describe our framework for role development and SP training for CEA. We address the following questions: 1. To what extent can SPs be trained to portray patients undergoing complex procedures? 2. In what ways can a framework for case development and SP training enhance the authenticity of complex procedural scenarios?

METHODS

The role of SPs in this study was to contribute to an authentic scenario that involved a preoperative interview between the operating surgeon and patient in which consent was obtained, followed by a scenario in which the operation was performed on the carotid model in the SOT. SPs were recruited from our bank of experienced actors and selected because they reflected the physical characteristics of the patient roles and were available for the entire project.

The CEA model was developed by St. Mary's Hospital Regional Vascular Unit in conjunction with Limbs & Things (Bristol, UK). It consists of a plastic container containing simulated tissues, with a latex carotid artery in its depth (Fig. 1). The carotid artery contains a silicone "plaque," which allows for performance of an endarterectomy. The solid plastic casing ensures that there is a safe barrier between the operative field and the actor to whom the model is attached.

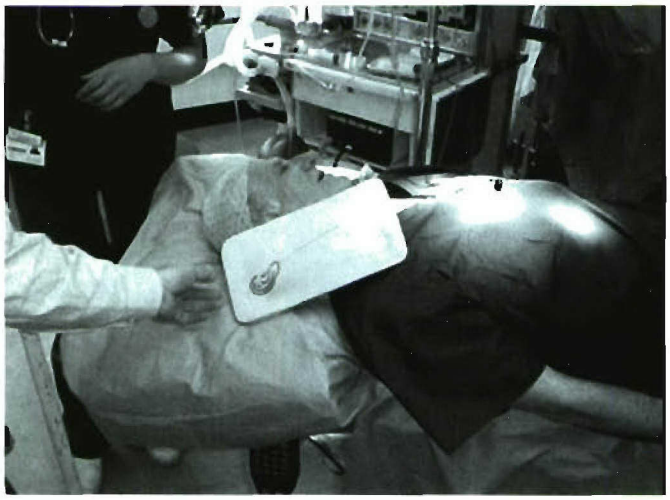

FIGURE 1. Simulated patient with CEA model prior to draping in the SOT.

The simulated artery is attached to a pump system, allowing for pulsatile "blood" flow and added realism during shunt insertion.

The model is placed in position alongside the patient's neck. The SP is then covered with surgical drapes to create an illusion of reality. The surgeon (working with an operative team of assistant, anesthetist, scrub nurse, and runner) carries out the procedure and is expected to interact with the SP and team members as they would in a real operating theater.

Each scenario is "directed" from a control room adjoining the SOT, using a multicamera video display, one-way mirror, and microphones to observe the operating team. The patient's physiological parameters (blood pressure, heart rate, and oxygen saturation) are displayed on a standard anesthetic monitor, controlled via a mannequin-simulator computer interface (SimMan, Laerdal Corporation). The SimMan mannequin is removed from the operative environment for these simulations. For the crisis simulations, two standardized scenarios were developed (severe bradycardia and stroke). Changes of heart rate and blood pressure are displayed on the anesthetic monitor (which is visible to the surgeon) and the sound ("beep") of altered heart rate is audible to all participants. In both crises, the anesthesia professional should respond by telling the surgeon about the changes in hemodynamics and the patient's clinical condition if the surgeon fails to notice these of their own volition. All changes are controlled by a surgeon in the observation room to allow for changes to be timed to occur at the clinically relevant points.

An audiolink with the SP allows the researcher to prompt specific behaviors such as intraoperative stroke. In addition, SPs can use the changes of "beep" frequencies and the anesthesia professional's verbal response as cues to simulate clinical symptoms consistent with the crisis as it evolves. If the surgeon manages the crisis appropriately, the simulated vital signs adjust once again to normal values. The SP's behavior will revert to normal when prompted by the anesthesia professional to simulate recovery from the intraoperative crisis. There is a marginal delay in the patient's response to the simulated hemodynamic changes (a few seconds), which is comparable to a real patient's response and therefore realistic.

As an aid to role development, SPs who were not taking the part of patient during a given scenario would sit alongside the surgeon researcher, observing the responses of the operating team and being instructed in details of surgical technique and team behavior.

Each surgeon completed two operations—a noncrisis scenario followed by a crisis scenario (ie, patient develops neurologic impairment, dysphasia following hypertension).

Framework for Case Development and Training of Simulated Patients for Complex Procedures

Figure 2 outlines a framework for case development and training SPs for complex procedures and operations. The purpose of the research or training program for which the simulation is being designed guides the entire development process.

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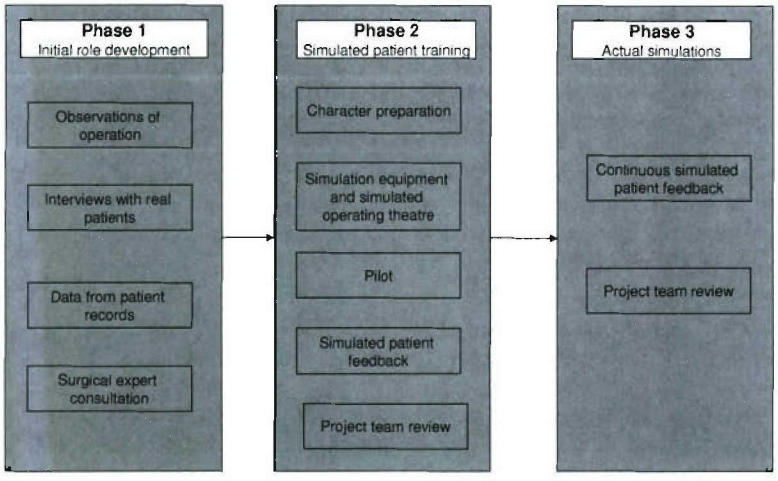

FIGURE 2. Framework for case development and SP training for complex procedures.

Phase 1: Initial Case Development

The case developer creates a case or "role" focusing on the patient's perception of their illness and the operation. It includes personal and medical characteristics, understanding of their symptoms, the operation, their fears, what they experience during the operation, what they have to do and when. Case developers observe the operation/procedure and the context in which it takes place. Interviews with real patients provide insight into their experiences of the operation. Reviewing data from actual patient records ensures that characters are grounded in reality, and the constructed patient record and corresponding written role are circulated for consultation with surgical experts for their judgments of authenticity.

Phase 2: Simulated Patient Training

Phase 2 uses a range of methods including readings, discussion, experiential exercises, observation, and feedback. First, character preparation is achieved by providing SPs with their written role and factual information about the procedure. Second, the SPs are introduced to the simulation equipment and the SOT. Third, the scenario is rehearsed. Fourth, SPs evaluate their experiences until saturation is achieved with no new issues arising. Finally, after a full project review, final adjustments are made, incorporating feedback from both phases.

Phase 3: Actual Simulations

Phase 3 is the training or research program in which the SP will work. The continuing evaluation of the SPs captures new and unanticipated experiences. This consolidates the authenticity of the role and prepares the SP for a wide range of clinician behaviors.

The research questions were addressed using a qualitative approach (observations, interviews, and participant ratings). Research team members recorded their observations as field notes. The reactions of SPs to the role and training were explored through a written form completed after each scenario (Web addendum 1) and a semistructured group interview with the three SPs at three points during the project (conducted by D.N.). Surgeons used a 10-point rating scale to assess realism within the scenario as well as participating in individual interviews immediately after the simulations (conducted by C.W.). All interviews were transcribed.

Statistical Analysis

Observational and interview data were analyzed thematically, whereas descriptive statistics were calculated using SPSS 11.5 to summarize realism scores.

Ethics Approval

The study forms part of a larger study investigating intraoperative stress in surgeons and the validation of this scenario-based approach to learning technical and other professional skills for CEA. Ethical approval was granted by our hospital ethics committee (02.79 AM 1050 02/DD/317E)

RESULTS

Data were collected from 46 simulations conducted over 3 months involving 23 surgeons who volunteered to participate. They varied in their levels of experience and were evenly distributed across junior, intermediate, and consultant grades. Three actors were trained to perform two roles, each with a crisis or noncrisis scenario, and completed 14 to 16 scenarios each.

Surgeons' Perceptions of Realism of Simulated Patients

This section addresses the first research question. Mean scores of surgeons' ratings showed very high levels of realism achieved, both in consenting interviews and intraoperatively (for both crisis and noncrisis scenarios; Table 1). This high perceived level of realism was reinforced by surgeons' comments in postscenario interviews. When asked for aspects to improve realism of the SP, there were very few comments. Experienced surgeons noted that the SP spoke more than real patients, that timing needed to be improved (eg, onset of stroke was very quick), and real patients require more local anesthesia than that requested in the scenarios. Otherwise, the simulation seemed highly realistic.

Surgeon 1: "*. . .The simulation of the bradycardia was very good. . . And then, um, the simulation of the stroke was*

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TABLE 1. Surgeons' Ratings of Realism of the Simulated Patients in Consenting Interviews and Intraoperatively

	N	Mean	SD	Range
SP role 1: Consenting interview	21	8.3	1.3	6–9
SP role 2: Consenting interview	21	8.3	1.4	6–9
SP role 1: Noncrisis scenario	23	8.0	1.3	5–10
SP role 2: Crisis scenario	23	8.0	1.4	5–10

Ratings are on a 10-point scale, from not at all realistic (0) to totally (10) realistic.

good so we had to put a shunt in. So that was very realistic, you know. The actor was very good, the anesthetist and the actor were chatting away, perhaps more than I would have allowed in a real operation because of the laryngeal movement."

Surgeon 3: "*. . .It was realistic, I think it was realistic. Um, sometimes in real life they are more fidgety, they move more. But obviously they can't move, they've got the plastic stuck to them, but I think it's quite realistic. . .and the other thing is they sometimes have pain when you are doing the case, and you have to give more local anesthetic.*"

Surgeon 4: "*. . .He was fine, he was actually very good, and he did most, er, he actually made me worried. . . I just wondered what was happening to him, so he was good, but it was just that every once in a while I would just remember that I was doing a simulated thing and I find the core concept quite funny, very big brotherish, so, you know, I just found it, that's what made me smile, not because I didn't believe. . .*"

Simulated Patient and Project Team Evaluations of the Framework

This section contains the results relevant to the second research question.

Phase 1: Initial Case Development

Observations of Operation

All members of our research team attended at least one real CEA operation. Different patients were observed so that we built up a broad base from which to develop the scenarios. This included operations with and without complications. Experiences of the operating theater were documented in field notes and shared among the research team and with SPs.

Interviews with Real Patients

Five patients who had undergone CEA were interviewed according to the schedule [Web addendum 2]. The interviews and transcript production of real patient interviews took approximately 20 hours. Responses provided a range of experiences that informed the development of the SP roles (Table 2).

Data from Patient Records

SP characters were composites built from several real patients. This addressed the broad needs of the research and training projects in terms of complexity of patient presentation as well as anonymized the character.

TABLE 2. Key Aspects for SP Training Based on Interviews with Real Patients

Accurate understanding of purpose of operation: "unblock arteries" although varied in depth and breadth
Postoperative expectation that they would return to a more "normal" life
Surprised by high level of professionalism in the operating theatre
Positive interprofessional relationships in the operating theatre increased confidence and created calm atmosphere
Music was unexpected and calming
Listened to conversations on technical aspects of the surgery
Conversation was a helpful distracter
Received many supportive and encouraging comments
Feelings changed intraoperatively (fear, hot, cold, uncomfortable, claustrophobia)
Staff supportive in seeking out and relieving uncomfortable feelings
Preoperative feelings of fear largely disappeared intraoperatively
Physically difficult to talk intraoperatively (tongue numb and mouth dry)

Consultation with Surgical Experts

The patient record and corresponding written role was circulated to senior surgeons requiring minor revisions to the draft version.

Phase 2: Training of Simulated Patients

The SP training included preparatory reading, discussion of the procedure, experiential exercises and feedback on performance. All training took place in the SOT.

Character Preparation

Our SPs received a role description [Web addendum 3] as well as patient information leaflets (eg, http://www.vascularsociety.org.uk/patient/carotid.html/) and verbatim transcripts of interviews with real patients. These were read in advance of the first training session. Actors valued this preliminary reading highly.

Actor 2: "*The notes were much more detailed than I am used to—probably because this is so new. Although it was a lot to read, it was helpful having it ahead of time. Reading the interviews from (real) patients also made it real. This was so helpful and was different to other role-play experiences I've had. When you got down to playing the role you could draw on this helping you get into the role. It felt sort of personal having access to this information.*"

Simulation Equipment and the Simulated Operating Theater (SOT)

This step approach was highly valued by the SPs because it enabled them to consolidate sophisticated concepts.

Actor 1: "*Seeing the SOT helped to make sense of the role and the operation. It is hard to conceptualise on paper.*"

Pilot

Initial training focused on the operation in the SOT because this was the newest aspect of role-play for the actors and that which concerned them most. After rehearsing the operation, we moved to the preoperative interview where aspects of the patient's character were more on show. Each

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actor had an opportunity to work through two scenarios in the first training session (approximately 4 hours). If the actors were not directly involved in the simulation, they observed their colleagues from the control room with a surgeon (S.B.) who talked them through the stages of the operation and desired behavioral responses of patients. Again, this process was valued by the SPs.

Actor 3: *"The opportunity to sit with Steve (S.B.) while he ran the scenarios was helpful. I built up my knowledge of a broad range of responses this way. Having the detailed brief is great but it is not possible to anticipate every action of the surgeon. This insider knowledge sometimes fed into my performance."*

Simulated Patient Feedback

Written feedback suggested the role was relatively "easy" to play although initially perceived as difficult. At first SPs relied heavily on the audiolink with the control room but after several rehearsals (and observing each other), actors were able to anticipate the desired behavioral response based on the noise of the equipment and conversation in the SOT. After each SP completed five scenarios, there was no new information emerging in their written feedback. That is, saturation had been reached. It was apparent that, although the roles were very complex, the training enabled the SPs to view the role as "easy."

Actor 1: *"Playing this role you need a hyperawareness because not only are you using your experience of the preop interview but you've got to respond in a consistent way to the anesthetist, other staff, your audiocues and the equipment."*

Project Team Review

The project team reviewed the scenario in terms of the overall project goals after the pilot and made changes to minor aspects of the role.

Phase 3: Actual Simulations

Continuous Review of Simulated Patient Performance

Attention to detail became our focus once the proof of concept had been established. Direct surgeon–SP interaction was largely confined to the preoperative interview (consenting). SPs reported new behaviors of anesthetists such as walking to the end of the operating table and squeezing the patient's toes to assess sensitivity. Knowing the correct response for each foot was important. SPs reported that they were sometimes uncomfortable on the table and that careful placement of the carotid model at the outset was important.

Project Team Review

No further changes were made to the content of the role, although its presentation in the written training document was altered in response to what the SPs considered important.

DISCUSSION

This study shows that it is possible to develop cases and train SPs to portray patients undergoing a complex surgical procedure in the SOT. Our multidisciplinary approach ensures a range of perspectives are considered—those of surgeons, educationalists, actors and, critically, patients. The phased iterative approach initially focuses on core aspects of the procedure, going on to build up further layers of realism. However, the SP role is just one component of a complex scenario and must fit within educational or research goals. We believe we achieved an acceptable level of realism indicated by surgeons' ratings. Although surgeons had little direct interaction with SPs intraoperatively, the presence of SPs contributed substantially to the authenticity of the whole scenario.

We aimed to achieve consistency in SP performance in as much as this is possible in scenarios with a wide range of variables (eg, surgeon's professional skills, surgeon's technical skills, crisis or noncrisis scenario). The opportunity for SPs to observe each other in role and sitting alongside the control room operator enhanced role acquisition and achieved consistency in performances.

A feature of the framework is its emphasis on real patient experience, not just information provided by healthcare professionals. The responses of the SPs in this study strongly supported this approach. Although the interviews were time-consuming, the transcripts gave the SPs appropriate language, drawing on real patients' fears and concerns when expressing emotions during the simulated operations. Obtaining patients' perspectives provided access to thoughts and feelings that would otherwise have been unavailable.

Unlike other role-plays, where actors may draw on their own experiences from consultations, complex surgical procedures are uncommon and many SPs may not have experienced them first hand. Providing the transcripts to SPs enables them to perform authentically. The unexpected experiences reported by real patients are related to features often taken for granted by the health care professionals. Reacting to these cues as a real patient is important in achieving overall realism.

There are several limitations to this study. We explored one operation and used a small group of SPs, so the training framework may not apply to all procedures. It will be important to apply our framework on multiple occasions and to scenarios and procedures of differing complexity to fully evaluate it. Future studies could consider obtaining feedback on realism of the performance from all members of the operating theater team. The actors in our study were experienced SPs. It may be necessary to increase the amount of training with less experienced actors. If these scenarios are conducted for training purposes, then evaluating trainees' perceptions of this approach as an educational tool will be important.

One member of our research team (N.J.) is an SP, and she attended operating sessions (with permission) to observe the procedure firsthand. However, it is not feasible for all participating SPs to attend procedures. Providing a videotape of the procedure is likely to be a valuable SP training tool.

Although developed within a particular clinical setting, we believe the framework described here has wide application for developing other SP roles. Like Schuwirth and van

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der Vleuten (2003), we recognize that realism is just one important factor that impacts on assessment validity.[7]

In conclusion, we have presented a framework for case development and SP training for complex procedures. The framework fills a gap in the literature on SPs by providing information on a crucial step in creating realistic simulations. Our framework highlights the patient's perspective from the outset. A variety of drivers are likely to lead to the increased use of simulation for training and assessing health care professionals. It is therefore important that valid case development and training methods for SPs are created and tested.

An online only addendum for this article is available at www.simulationinhealthcare.com.

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Multipatient Disaster Scenario Design Using Mixed Modality Medical Simulation for the Evaluation of Civilian Prehospital Medical Response: A "Dirty Bomb" Case Study

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Disasters are defined as events that overwhelm local response capability and present myriad challenges to responding medical personnel.[1,2] Prehospital medical providers and hospital personnel can be confronted with a multitude of patients, unusual illnesses or injuries, failure to communicate, poor logistic support, the need for decontamination, and difficulties in perimeter control.[3–8] Concurrent demands often lead to task overload and performance failures.[9] After-action reports (Rhode Island Disaster Initiative Annotated Bibliography 2002, available at: http://www.ridiproject.org/downloads/annotated_bibliography.pdf) and disaster literature highlight recurring problem areas.[10–16]

The potential for a variety of natural and manmade catastrophic events makes health care provider preparation for mass casualty incidents (MCIs) both imperative and challenging. Analysis of disaster response often attributes failure to inadequate preparedness and the inability to follow designated plans.[17] Disaster training needs of medical responders may not be adequately represented in current instructional paradigms,[18] especially with respect to weapons of mass destruction (WMD) situations (Rhode Island Disaster Initiative Vulnerability Assessment 2002, available at http://www.ridiproject.org/downloads/vulnerability_assessment.pdf) In the absence of a published standardized methodology,[19–22] investigators applied mixed modality medical simulation (SIM) techniques to generate a multipatient WMD disaster scenario and accompanying evaluation tool for education and research purposes.

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STUDY OBJECTIVES

Study investigators aimed to create a repeatable and immersive medical simulation disaster scenario capable of eliciting and recording a representative selection of critical and objectively measurable aspects of on-scene civilian disaster medical response. Combining full-body manikin simulators and professional actors within a high-fidelity environment, the scenario was scheduled to be repeated with trained observers and comprehensive audiovisual systems for systematic collection of prehospital provider participants' clinical performance data and perceptions of simulation utility.

MATERIALS AND METHODS

Design of Simulated Disaster Scenario and Evaluation Tools

Investigators planned a precisely controlled disaster simulation scenario to elicit and study fundamental interventions in the initial phases of scene medical response. A nine-victim incident set in a family medicine clinic was scripted. Simulated terrorist detonation of a low-yield conventional explosive device dispersing a chemical payload of Lewisite (dichloro-2-chlorovinyl arsine) was selected (see Web Enhancement 1). The scenario was designed to have sufficient realism and plausible complexity to immerse participants in autonomous engagement of disaster response practices based on their judgment and training. The capacity for monitoring of distinct and quantifiable events and activities in disaster response was also essential. A seven-member regional panel of disaster experts and an international advisory board provided confirmation of content validity.

Application of High-fidelity Medical Simulation to Disaster Scenario

High-fidelity medical simulation has previously been used in military[23] and hospital staff[24–26] disaster training. Investigators staged the study sessions in a regional simulation center with digital video-recording and wireless communication capabilities. High-fidelity techniques were used for consistent and realistic rendering of disaster conditions and challenges. Contribution of fully-interactive manikin features to the disaster simulation was maximized.

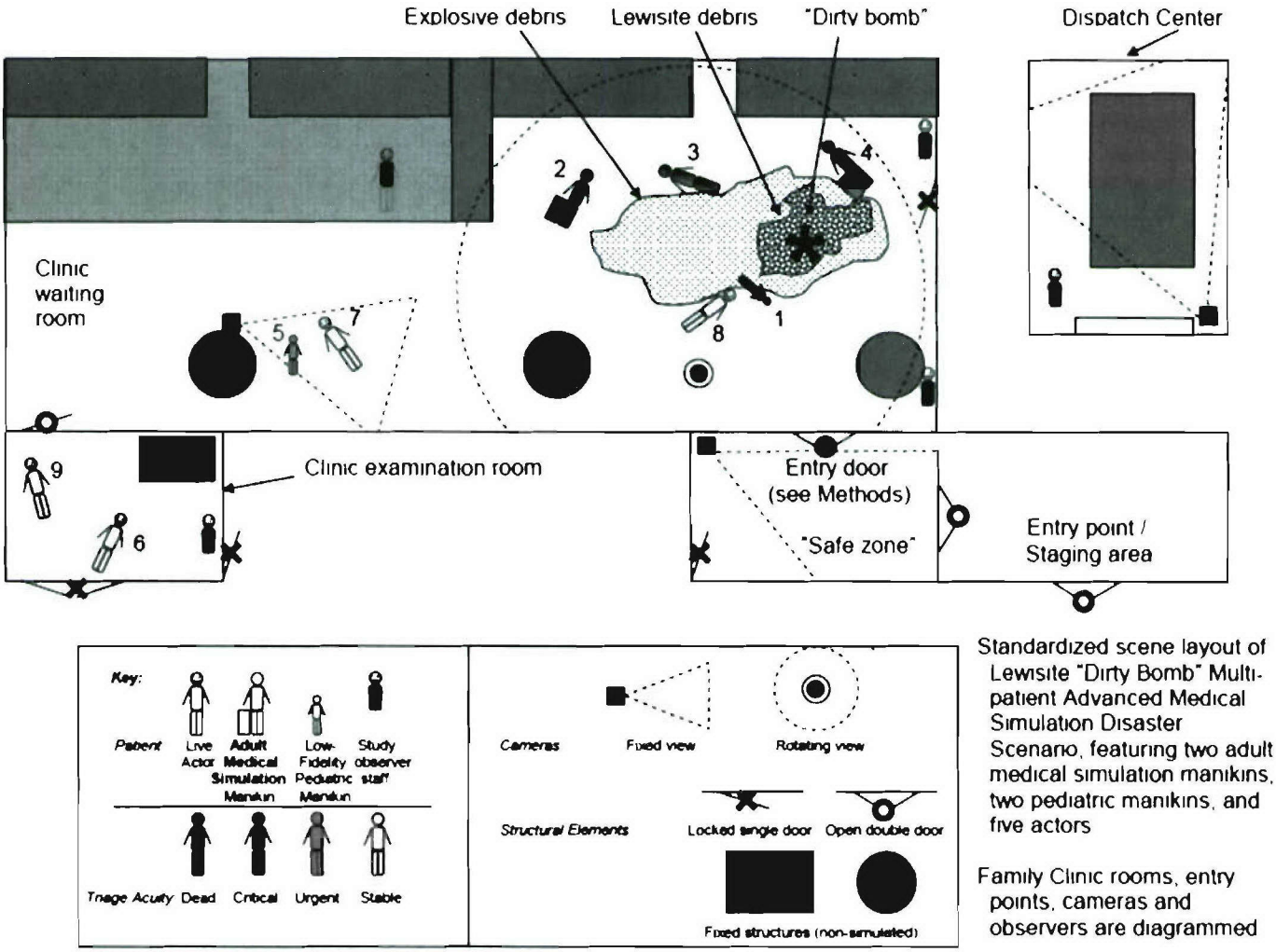
Physical Layout

The scenario's simulated medical clinic was precisely mapped for reproducible environmental conditions (Figs. 1 and 2). Assorted debris, construction parts, and office supplies were used to construct the disaster setting (Fig. 3). Minimal ambient lighting, Fog F/X generator (MME, Farmingdale, NY) for simulated smoke and dust, and Firefly lights (ACR, Fort Lauderdale, FL) as fire-alarm strobes set up the incident scene.

Victims

Patients varied in severity of injury to reflect estimates based on the Centers for Disease Control Mass Trauma Casualty Predictor.[27] Underlying illnesses and blast injury patterns combining blunt and projectile trauma were detailed. Airway compromise, thoracoabdominal hemorrhage, life-threatening fractures, and severe neurologic trauma were distributed across victims (Fig. 2). Progressive deterioration from injuries was coordinated with a scenario clock and exactly described by vital sign cards, actor instructions or manikin programming. Lewisite exposure was made apparent through prominent cutaneous blistering moulage, respiratory distress and vascular third-spacing pathophysiology.[28-30] Combined traumatic and toxicologic insults were modeled when appropriate, along with psychologic trauma. Entrapment and immobilizing injuries kept patients situated within the clinic environment at time of study responder arrival. These arrangements permitted use of nonportable manikins and the study of initial onsite disaster medical responder actions (as opposed to hospital-based disaster response expected of later disaster phases).

Experienced simulation staff members followed detailed standardized scripts to control two SimMan advanced medical patient simulators (Laerdal Medical, Wappingers Falls, NY). Allowing for invasive procedures and tight control of physiologic parameters, the SimMan manikins were programmed as entrapped clinic workers with major trauma and Lewisite exposure (see Web Enhancement 2 for sample programming). Changes in respiration, lung sounds, pulse, blood pressure, oxygen saturation and electrocardiographic signals were measurable by study subjects. SimMan victims were monitored for endotracheal intubation, IV access, med-



Standardized scene layout of Lewisite "Dirty Bomb" Multipatient Advanced Medical Simulation Disaster Scenario, featuring two adult medical simulation manikins, two pediatric manikins, and five actors

Family Clinic rooms, entry points, cameras and observers are diagrammed

FIGURE 1. Multipatient Mixed Modality Medical Simulation "Dirty Bomb" Scenario layout.

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Patient	Age / Gender	Initial Acuity	Progression	Role	Injuries	Appropriate Treatment Actions (ATAs)**
①	5yr ♂	Dead	No progression	Pedi manikin	Blast to face Multi-system trauma	Determination of fatality
	Vital signs HR 0 BP -/- RR 0					
②	45yr ♂ (M.D.)	Critical	Death in 15 minutes	SimMan (entrapped)	Airway compromise Head + chest injury, shock Inhaled / skin Lewisite	Determination of fatality
	Vital signs HR 114 BP 92/50 RR 20					
③	18yr ♂	Critical	Death if inadequate Tx	Actor	Splenic injury, shock Inhaled / skin Lewisite	O2; IV; Removal from scene; Hospital transport
	Vital signs HR 126 BP 84/30 RR 26					
④	63yr ♂	Critical	Death if inadequate Tx	SimMan (entrapped)	Scalp hemorrhage, shock Unstable femur fracture Extremity impalement Inhaled / skin Lewisite	Spine immobilization; O2; IV; Attempt adv. airway; Splint; Removal from scene; Hospital transport
	Vital signs HR 74 BP 102/39 RR 26					
⑤	11mo ♀	Urgent	Death if inadequate Tx	Pedi manikin	Inhaled Lewisite Vomiting	O2; Removal from scene; Hospital transport
	Vital signs HR 122 BP 96/64 RR 38					
⑥	17yr ♂	Stable	No progression	Actor	Lacerations / arm fracture Late Lewisite	O2; Splint Removal from scene; Hospital transport
	Vital signs HR 72 BP 128/90 RR 20					
⑦	38yr ♂ (father of #5)	Stable	No progression	Actor	Lacerations Late Lewisite	O2; Removal from scene; Hospital transport
	Vital signs HR 108 BP 154/96 RR 20					
⑧	36yr ♀ (mother of #1)	Stable	Death if inadequate Tx	Actor	Late Lewisite	O2; IV, Removal from scene; Hospital transport
	Vital signs HR 124 BP 148/100 RR 40 sobbing / hysterical					
⑨	42yr ♂ (R.N.)	Stable	No progression	Actor	Critical incident stress Late Lewisite	O2; Removal from scene; Hospital transport
	Vital signs HR 88 BP 132/88 RR 20					

**Initial Patient Location / Contact ATA is common to all victims

Key: adv. = advanced BP = blood pressure, HR = heart rate; IV = intravenous cannulation; M.D. = physician, mo = month; O2 = oxygen, pedi = pediatric R.N = registered nurse; RR = respiratory rate; Tx = treatment; yr = year ♂ = male; ♀ = female

FIGURE 2. Multipatient Mixed Modality Medical Simulation "Dirty Bomb" Scenario patient descriptions.

FIGURE 3. Multipatient Mixed Modality Medical Simulation Disaster Scenario in progress. Adult manikin on right, actor victim on center left and four prehospital study subjects in protective gear.

ication administration, cardiopulmonary resuscitation (CPR), and defibrillation.

CodeBlue III (Gaumard Scientific, Miami, FL) pediatric manikins represented a 1-year-old exhibiting cardiopulmonary deterioration and a 5-year-old with nonsurvivable injuries. These manikins were compatible with intubation, IV cannulation, and CPR.

Five professional actors intensified the dramatic conditions necessary for the simulation. Actors were employed in the same role for sessions and were given instructions online to reduce intersession variability. They participated as immobilized clinic patients, parents of the pediatric victims, and a clinic nurse acutely suffering from critical incident stress. Each simulated or live patient was clothed and professionally moulaged with Casualty Simulation Moulage Kit (Simulaids, Woodstock, NY).

Medical Response Actions

Patients' vital signs were able to be assessed either through palpation of manikin chest rise and pulses or by review of laminated cards distributed to actors. IVs could be started in manikins or verbalized for patient actors. Stated recognition of the need for decontamination and antidote administration was considered adequate for the purposes of this simulation. Offsite communication was facilitated with a simulated 911 emergency dispatcher who arranged contact with local and regional facilities. Reasonable resources were made accessible on a predetermined timescale. Victim extrication involved spinal immobilization and activation of an offsite structural collapse crew. Transportation from the scene required proper communication with dispatchers regarding hospital destination, request for supplemental emergency medical services (EMS) units and transfer of care to receiving personnel.

Medical Kits

All study participants were issued standard kits based on state Advanced Life Support ambulance requirements. Basic airway devices and intubation kits were made available with oxygen sources. Model M CCT defibrillator/cardiac monitor (Zoll Medical, Chelmsford, MA), intravenous (IV) supplies, and medications were provided. Wound dressings, spinal immobilization equipment, and splints were integrated into the kits. All subjects had access to personal protective equipment (PPE) in the form of PA3NBC-filtered PA30

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Powered Air-Purifying Respirators (PAPRs; Bullard, Cynthiana, KY) and Tychem SL impervious total-body gowns (Lakeland Industries, Ronkonkoma, NY). Team members communicated through portable Radius GP350 wireless radios (Motorola, Schaumburg, IL) with modifications for PPE.

Selection and Development of Objective Measures

An evaluation tool was designed concurrently with the SIM scenario for objective measurement of critical on-scene medical response and timeliness (see Web Enhancements 1 and 3). The tool was constructed with expert panel input for onsite observers to directly record clinical performance and timeline data distributed across nine concurrent movable patients without disrupting the scenario. Simple and readily recognizable actions were chosen as binary data elements.

The first data element was the "entry–no entry" strategic response decision. At scenario initiation, responders were faced with limited dispatch information to a potential bombing incident. Encountering a nonsecured and disarrayed clinic environment with smoke and flashing fire alarm strobes, responders could verbally communicate across a closed entrance door with victims, who were specifically instructed to draw rescuer attention to their Lewisite symptoms (blistering and respiratory distress). After this opportunity for rapid formulation of scene assessment (ie, explosive device detonation accompanied by atypical cutaneous and respiratory symptoms in victims both within and outside the immediate blast radius), teams' decisions to enter into the simulated hazardous environment and to use PPE were recorded. Those deciding to enter the disaster using inadequate PPE or without requesting PPE would be halted and only allowed to re-enter after donning proper PPE or activating hazardous materials (HazMat) teams. (As the environmental hazards would "incapacitate" unprotected responders, this provision was necessary for study scenario continuation.)

Appropriate treatment action (ATA) checklists, personalized for each of the nine victims, were the next evaluation tool data elements. Each ATA was one of nine clearly identifiable and observable actions (eg, administration of oxygen) and was chosen as a marker of responder activity. Every victim was a priori assigned ATAs with input from the expert panel. Initial location and contact by responders was observed for all victims. Recognition of fatality constituted ATAs for two victims. The seven remaining patients required administration of oxygen, removal from scene and arrangement of hospital transport. Specific victims were observed for additional ATAs such as extremity splinting, IV cannulation and advanced airway management. In all, 39 ATAs were distributed over nine victims in the scenario. Optimal response for study purposes required completion of all 39 ATAs by each study responder team.

The number of ATAs performed per victim was recorded with timeline information. If a particular victim was assigned five distinct ATAs, a study team could be credited with a maximum of 5 *unique* ATAs for that patient. A separate data element, *total* ATAs, accounted for repetitions of ATAs performed on the same patient by a particular team (eg, starting two IV catheters). Repeated ATAs were not interpreted in either a positive or negative manner relative to team performance. Separate from ATA nonperformance, responder commission of actions harmful to victims was recorded by observers in a descriptive manner.

Distinct from treatment actions expected of all study subjects, WMD-specific supplemental treatment actions (STAs) were also recorded. Teams' recognition of need for decontamination and British anti-Lewisite (BAL) administration was tracked for specific victims. These STA data points were not classified as ATAs, due to the need to differentiate WMD-related actions from "routine" disaster response activities.

An additional data element, the victim transport order strategic response decision, was nested into the scenario and noted for each study team. This data was obtained to determine concordance with the optimal transport arrangement as designated by investigators. Parent-child victim pairs and two seriously injured victims entrapped by minor structural elements posed challenges.

Participant Orientation

Participants were recruited from statewide prehospital systems and block-randomized into 12 teams. Consent and signed waivers of liability were obtained. A comprehensive orientation with video briefing familiarized subjects to the high-fidelity medical simulation environment and manikins without revealing details of the study scenario. The interactive nature of simulated encounters and facilitator roles were presented in detail. A methodical safety review for all staff and participants was conducted prior to starting study sessions. The hospital Institutional Review Board approved the study.

Scenario Implementation

Twelve study sessions were initiated and conducted with strict adherence to scenario script and parameters by a Simulation Session Director. Synchronized time-dependent progression of actors and manikin systems' physiologic states maximized scenario automation. Unless subjects completed specific defined actions to alter scenario progression, each actor and manikin deteriorated across all sessions in an identical sequence and manner, as reflected in mental status, verbalizations, and vital signs. Unexpected events and deviation from the script were minimized by debugging through a prestudy pilot session with trial subjects. During sessions, investigator intervention was instituted infrequently and solely to provide requested information and equipment or to guarantee the safety of study subjects. Sessions were terminated upon scene evacuation/hospital transport arrangement for all movable victims and determination of fatality for nonresuscitable victims.

Two clocks were used to time the occurrences of disaster response activities. A scenario clock reflected time within the simulated environment, whereas a study clock tracked the passage of real time. Both clocks were started upon scenario initiation. Victim morbidity at the time of initial responder contact was based on elapsed scenario clock time. Times to ATAs and STAs by both groups were measured from scenario entry by the unadjusted study clock with

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1-minute resolution. This arrangement permitted adjustment of the scenario's temporal parameters while continuously recording real-time study participant action.

Four video-cameras and five observers with study evaluation tools were positioned for data gathering (Fig. 1). Observers had been instructed in standardized guidelines on scoring with the tool and had participated in a preparatory scenario "dress rehearsal" and one pilot session with trial subjects. Research subjects' perceptions of SIM aspects of the disaster scenario were anonymously surveyed upon session completion.

Data Analysis

Quantitative descriptive analysis of study participant demographics, recorded data elements, and survey responses was performed. Spearman rank-order correlation analysis was completed for victim transport order by teams. Software package SAS version 9.1 (SAS Institute, Cary, NC) was used for analyses.

RESULTS

Characteristics of Study Subjects

Study sessions were repeated twelve times over 3 months to enroll 48 participants. Most were fire department-affiliated EMTs at the Intermediate (EMT-I) certification level, with 10 paramedics (Table 1). Clinical experience averaged 8 years and 8% were female.

Session Conduct and Clinical Performance Data Acquisition

All sessions were completed as scripted and lasted 36.3±7.4 minutes. Scene entry and victim transport order data were collected for 100% of teams. Out of 468 potential ATAs and 168 potential STAs, 450 and 51 data points were recorded as being completed by study teams (Table 2). In all, 93.8% of ATAs were attributable to individual responders. Times were available for all ATA data (see Web Enhancement 1).

Clinical Performance Data

Nine of 12 teams entered the hazardous scenario environment without PPE at 46±26 seconds into the drill; three teams donned PPE and entered at 798±150 seconds. In all, 348 unique ATAs representing 74.4% of optimal response were recorded across 12 sessions, with a mean ± SD of 29.0±2.3 per team. Overall, 102 repeat ATAs were performed, with each team repeating an average of 8.5±11.3 ATAs. Mean ± SD and median for unique ATAs by individual study subjects were 6.8±3.1 and 6.5 (95% CI 5-8) respectively, and 2.0±2.8 and 1 (95% CI 1 to 2) for repeat ATAs.

Teams located all nine victims per session (108 ATAs, 100% of optimal response) and recognized 20 fatalities out of 24 nonresuscitable patients across all sessions (83%). Oxygen administration was appropriate for seven of the nine patients based on scenario script, whereas IV cannulation should have been accomplished for three of nine patients. In all, 60% and 31% of disaster victims in these subsets were supplied with oxygen and IVs respectively. Teams appropriately applied a cervical collar and backboard on three patients (25%), whereas long-bone splinting of victims was performed for 4 of 24 fractures (17%) over all study sessions. Advanced airway management involving endotracheal intubation was attempted by three teams (12%). Seventy-nine victims (94%) had transportation to a hospital setting arranged.

Times to first ATA from scene entry were under 2 minutes for all teams. Times of last transport ATAs for movable patients were between 15 and 32 minutes from entry (mean ± SD 22.0±5.7 minutes). Necessity of decontamination and antidote administration was recognized by teams for 40 (48%) and 11 (13%) of resuscitable victims, respectively. Order of patient transport arrangement by teams exhibited good concordance with optimal patient transport order (Spearman rank order correlation coefficient 0.977).

Participant Response Survey

In all, 43 study subjects completed a five-point Likert scale survey. The statement "The simulation was realistic" received a mean score of 4.4±0.7 in agreement from 43 respondents; the median score was 5.0. Mean and median scores for "The exercise was difficult" was 3.9±1.0 and 4.0 for 42 participants.

Debriefing

Debriefings focusing on scenario content, clinical implications, and participant stress were conducted immediately after sessions, as was a poststudy conference reviewing and discussing preliminary study findings. Both specifically addressed triage processes, the inevitable changes in clinical practice parameters under disaster situations, and simulated victim fatalities. With respect to psychologic stresses associated with the study scenario, discussion focus was guided from perceptions of individual performance towards team accomplishments of medical response responsibilities with limited resources inside a hazardous environment. This aimed for positive reinforcement of responder resourcefulness and teamwork behaviors.

DISCUSSION

Insofar as the study of on-scene disaster medical response is severely limited in real-time and mostly limited to after-event analysis, sophisticated medical simulation scenar-

TABLE 1. Demographic Characteristics of Study Subjects

Characteristic	Study Subjects
n	48
Age, years	34.1 ± 6.4
Female	4 (8)
EMT level	
Basic	3 (6)
Intermediate	35 (73)
Paramedic	10 (21)
Clinical experience, years	7.9 ± 6.0
Prior WMD training	25 (52)

Data are n (%) or means ± SD.

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TABLE 2. Clinical Performance Data Measures Recorded During Multipatient Mixed Modality Medical Simulation Disaster Scenario (n = 12 teams)

	n (%)	Required Actions for Optimal Response	Recorded Actions (% of Optimal Response)	Spearman Rank-Order Correlation Coefficient
Scene response decision of teams				
Entry without PPE	9 (75)			
No entry without PPE	3 (25)			
Appropriate treatment actions (ATAs)				
Unique ATAs		468	348 (74.4)	
Initial patient location and contact		108	108 (100)	
Determination of fatality		24	20 (83)	
Oxygen administration		84	50 (60)	
Intravenous cannulation		36	11 (31)	
Spinal immobilization		12	3 (25)	
Extremity splinting		24	4 (17)	
Advanced airway attempt		12	3 (12)	
Removal from scene		84	70 (83)	
Transportation to hospital arranged		84	79 (94)	
Repeat ATAs		—	102 (—)	
Total ATAs		—	450 (—)	
Supplemental treatment actions (STAs)				
Recognition of need for decontamination		84	40 (48)	
Recognition of need for antidote		84	11 (13)	
Concordance with optimal transport order				0.977

ios may represent a novel work-around for disaster research. Expanding on previous concept work,[21,31] investigators developed a repeatable WMD scenario incorporating fully-interactive medical simulation manikins, lower-fidelity full-body pediatric manikins, professional actors, a controlled simulated environment, and an objective evaluation method. Emphasis was placed on generating detailed environmental and victim descriptions to promote consistently reproducible simulations.

Objective measures of appropriate disaster medical response actions were developed with expert panel input for the disaster scenario and used to collect data during simulation sessions. The focus on actual onsite performance of response actions, made possible through maximal use of simulation technology, and the comprehensive data recording by trained observers with redundant systems and audiovisual documentation built on prior efforts. Certain challenges noted during previous studies, such as difficulty in identifying responders when attributing specific actions and monitoring for transitions in patient care across different settings,[21] were circumvented by the use of a defined SIM study setting. Whether the objective measures are generalizable to real-life disaster medical response remains to be determined.

As for the value of multipatient mixed modality medical simulation disaster scenarios in emergency preparedness, these study sessions revealed an urgent regional need to re-examine several aspects of current medical response. Notwithstanding the limited environmental verisimilitude in the absence of live Lewisite (unlike specialized military training), most study subjects were observed to enter a nonsecured, clearly dangerous scene just as in numerous real-life instances resulting in healthcare provider incapacitation.[32,33] Toxic agent identification and recognition of need for decontamination procedures and antidote administration were inadequate, even among subjects receiving prescenario instruction in WMD and reinforcement of scene safety principles. Separately, routine prehospital interventions such as cervical spine and extremity immobilization were performed on less than a quarter of victims needing them.

Ongoing efforts to demonstrate SIM applicability and validity with respect to prehospital provider preparation may assert SIM exercises to be a valuable testing platform for the scientific assessment of on-scene disaster response. If successful, future disaster SIMs may prove useful in studying prehospital PPE threshold criteria and practical training to minimize secondary casualties[34] and to mitigate deleterious delays associated with HazMat-dependent scene entry. Disaster SIM endeavors may assist in effective selection, instruction, and optimization of onsite medical response actions. More recently, training of the lay public for disaster response and health care professional preparation in the coordination of intercommunity resources have been suggested for emergency preparedness.[18] Both of these could be facilitated through application of SIM-enhanced disaster scenarios. Extension into the realm of certification, such as through the National Disaster Medical System (NDMS) and National Disaster Life Support (NDLS) programs, may become feasible.

In summary, 12 sessions of a repeatable, objectively evaluative, mixed modality simulation disaster exercise were planned, developed, and successfully conducted. On-scene response data recorded with the accompanying evaluation tool demonstrated the ability to acquire timed, quantitative

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information regarding clinical performance in an immersive and complex medical simulation disaster environment. Case study information regarding development and implementation of our disaster scenario and evaluation tool has been presented for further simulation application in disaster research and training.

The evaluation tool used in this study was not externally validated. Due to study design and session complexity, investigators were unable to ascertain whether teams entering without PPE entered regardless of acknowledged risk, disregarded the risk due to the simulated nature of the disaster, or did not recognize the risk. Simulation of certain complex medical response actions and comprehensive disaster response (implementation of incident command system, perimeter control, and other specialized nonmedical actions) was not attempted due to logistic limitations and study focus. Incorrect or unnecessary responder actions were qualitatively recorded by observers, but were not factored into objective assessments of scene response completion due to concerns regarding imprecise and disputable assignment of negative valuation. The scenario was not structured to determine outcome measures and could not extrapolate results to actual disaster situations.

The value of simulation technology was not systematically addressed, in that comparable study sessions using traditional disaster exercise designs without sophisticated medical simulation were not conducted. One scenario was used to examine only medical response actions by EMTs from a single region, without provision to follow up on learner retention. Objective assessment of intersession consistency was not performed.

An online only addendum is available for this article at www.simulationinhealthcare.com.

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Integrating Echocardiography into Human Patient Simulator Training of Anesthesiology Residents Using a Severe Pulmonary Embolism Scenario

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Introduction: Echocardiographic images were integrated into patient simulation (PS)-based resident training with a goal of highlighting the applicability and limitations of pure pressure-based measurements in the management of different disease states.

Methods: Relevant echocardiographic images were selected, categorized, and sequenced to best represent specific hemodynamic changes and incorporated into a Powerpoint slideshow. Appropriate PS scenarios were then created to represent the hemodynamic changes seen with the selected pathophysiologic states. Instructors then displayed the visual images along with PS scenarios during lecture and testing sessions at the PS bedside during standard didactic sessions with small groups of anesthesiology residents and informal resident testing sessions.

Conclusions: The use of echo images to demonstrate, in real time, the hemodynamic consequences of changes in myocardial contractility, cardiac chamber volume, and valvular function is possible during PS in anesthesiology residency training. Echo imaging as a teaching tool during anesthesiology residency may yield a greater understanding of the pathophysiology of certain disease states, ultimately leading to faster diagnosis and more appropriate intervention by anesthesiologists.

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Patient simulation (PS) has become a versatile teaching tool used to train both junior and senior anesthesiology residents because PS offers significant advantages in training these residents to diagnose and treat acute, severe, and often life-threatening events.[1] Additionally, PS can be used to evaluate resident skill in critical event management.[2]

Historically, PS has used standard patient monitors including electrocardiography (ECG), pulse oximetry (SpO_2), noninvasively measured blood pressure (NiBP), and end-tidal CO_2 ($EtCO_2$) monitoring to provide important patient data. Invasively measured pressures such as arterial, central venous, pulmonary artery, and pulmonary artery occlusion (wedge) pressures can also be used. In general, these information sources are clinically useful because the normal relationship between cardiac pressures and volumes is maintained in many situations.[3]

Certain pathophysiologic states, however, cause the normal pressure-volume relationship to be distorted.[4–6] For example, long-standing hypertension may cause cardiac muscle hypertrophy and subsequent diastolic dysfunction. Diastolic dysfunction may then produce a shift in the normal pressure-volume relationship, such that a greater pressure is produced (compared with the normal state) for any given volume. Similarly, stunned myocardium, as seen following subarachnoid hemorrhage,[7,8] may alter cardiac contractility with resultant dissociation between filling pressures and ventricular volume. Because the pressure-volume relationship is changed under these conditions, the diagnosis and management of these conditions may be erroneous if based entirely on pressure monitoring. Adding visual information about cardiac contractility and volume utilizing echocardiography may improve diagnosis and treatment of these pathophysiologic states.[9]

The integration of echocardiographic images into medical school physiology courses has been shown to enhance medical student understanding of normal cardiopulmonary and cardiovascular physiology.[10] The use of simulated echocardiography with PS to demonstrate visual cardiac changes in relation to cardiac pressure changes seen within the context of normal and disease states may likewise improve anesthesiology resident understanding of normal and abnormal pressure-volume relationships. Additionally, this training may lead to earlier recognition of these pathophysiologic states with their resultant earlier diagnosis and treatment. This report describes the integration of echocardiographic images and the PS during anesthesiology residency training using both didactic and testing sessions for conditions with abnormal pressure-volume relationships. Additionally, a severe pulmonary embolism scenario is described as an illustrative example of this concept.

MATERIALS AND METHODS

To demonstrate the hemodynamic alterations of specific pathophysiologic conditions via simulated echocardiography with the human patient simulator, appropriate still frame and video echocardiographic images were selected, in

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accordance with applicable copyright laws, from the Departmental Echocardiography Library, internet websites[11] and from suppliers of commercially available educational products.[12] Because available echocardiographic images were in varying formats, they were converted using Adobe Premier Version 6 (Adobe Systems, San Jose, CA) to standard formats for use in this training program. All still images were stored in the Tagged Image File Format (TIFF) or Joint Photographic Experts Group (JPEG) formats and the video files were stored as Moving Picture Experts Group (MPEG) or Audio and Video Interleave (AVI) formats. Dazzle Digital Video Creator 150 (Avid, Mountain View, CA) was used to convert echocardiographic images from previously recorded analog Video Home Service (VHS) cassettes to digital formats, such as AVI or MPEG formats. Additionally, Studio Version 9+ and 10+ (Avid, Mountain View, CA) were used to select only the relevant portions from the stored visual images.

These images, once converted, were then sequenced to represent the chronicity of the worsening pathophysiologic state and incorporated into a PowerPoint slideshow (Microsoft Corp., Redmond, WA). Using tools within the PowerPoint software, the composite video images were programmed to autoplay within the slideshow and were looped to simulate continuous cardiac cycles. Using a laptop computer separate from our PS control computer, placed in a position similar to the operating room, echocardiographic images were viewed during training and testing sessions.

Following the preparation of the echocardiography simulations, PS scenarios were written (using the Medical Educational Technologies Incorporated [METI] Human Patient Simulator [METI, Sarasota, FL]) to represent the hemodynamic sequelae of worsening pathophysiology in these selected disease states. If the preprogrammed scenarios in the METI database were hemodynamically inappropriate, new scenarios were created utilizing appropriate hemodynamic alterations to the "Standard Man Scenario."

Anesthesiology residents within the training program were the primary educational audience for echocardiographic PS demonstrations. Typically, small groups of two or three residents per session attended sessions conducted at the PS bedside. Echocardiographic imaging was used in both didactic and testing formats.

During didactic sessions, residents were presented with a clinical scenario at the PS bedside and were then demonstrated pressure-volume changes by an experienced instructor. Typically with junior residents, the instructor would frequently pause the PS and imaging slideshow to correlate the echo images to the changes in the invasively and noninvasively obtained monitoring parameters. With more advanced residents, the instructors would provide a scenario with appropriate PS hemodynamic simulation and would allow residents to proceed independently with diagnosis and management of the "patient's" condition. At the conclusion of the exercise, the instructor would review the scenario, adding echocardiographic images to illustrate the cardiac changes represented by the invasive and noninvasive monitors during the different stages of the simulated disease state.

During testing sessions of advanced residents, the instructor described a clinical scenario and residents proceeded as in the didactic session. However, residents were instructed to request echo images (in appropriate mode and view) to assist them in managing and diagnosing the case. Residents were then required to justify their choice of echo images and their subsequent case management.

PULMONARY EMBOLISM (EXAMPLE SCENARIO)

After the collection and conversion of appropriate echocardiographic images, a Powerpoint slideshow was created to demonstrate the clinical consequences of the pathophysiology. Additionally, because there was no standard scenario representative of an acute, severe embolic pulmonary embolism in the METI PS database, an appropriate hemodynamic scenario was written (Table 1).

At the time of demonstration, an instructor outlined the clinical scenario, including the patient location (which ultimately changed the available patient treatment options). From this information, residents were required to make several decisions, including the choice of hemodynamic monitors. Occasionally, the instructor presented the case with certain hemodynamic monitors already in place and provided justification for their placement. This facet of the program was dependant on the teaching audience and teaching objectives.

The simulated program was then started and echocardiographic images began with baseline views of the main pulmonary artery (MPA) and the right pulmonary artery (RPA) and views of the heart in the long and short axes that demonstrated normal contractility and volume status. After discussion of the features shown in each of the baseline images was completed, the simulated patient was programmed to develop an acute, severe pulmonary embolism.

The simulated hemodynamic changes included a rapid decrease in end tidal carbon dioxide partial pressure, an increase in pulmonary artery and central venous pressures, systemic hypotension, and mild hypoxemia. At the same time, echocardiographic images demonstrated transit of thrombus through the right atrium, the tricuspid valve, the right ventricle, MPA, and into the RPA (Fig. 1). Echo images of the heart then demonstrated volume (Fig. 2) and pressure overload of the right atrium (RA) and ventricle (RV) with septal shift (Fig. 3), images illustrating right to left shunting across a patent foramen ovale (PFO), and paradoxical thromboembolism across the PFO (Fig. 4).

The simulated scenario was programmed to continue beyond the initial pulmonary embolism event. The clinical condition of the simulated patient rapidly deteriorated and required appropriate usage of the American Heart Associations guidelines for Advanced Cardiovascular Life Support (ACLS) of ventricular tachycardia, pulseless electrical activity, and asystole.[13] The instructor was allowed to stop both the program simulation and the echocardiographic images to teach an important point and, if desired, the simulated patient could be reset to a normal hemodynamic state.

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TABLE 1. Copy of the program for the scenario of severe pulmonary embolism as written for the METI HPS. [Baseline = standard man]

▼Baseline
▼*Events*
set Fixed Heart Rate **to** 72 beats/min
▼*Transitions*
▼Severe_PE
▼*Events*
set Fixed Neuromuscular Blockade **to** 100%
set Resistance Factor: Pulmonary Vasculature **to** 2 **over** 30 seconds
set Resistance Factor: Venous Return **to** 0.1 **over** 30 seconds
set Venous Capacity Factor **to** 0.5 **over** 30 seconds
set Contractility Factor: Left Ventricle **to** 0.12
set Shunt Fraction **to** 0.25 **over** 1 minute(s)
set PetCO2-PaCO2 Factor **to** 2 **over** 12 seconds
set Cardiac Rhythm Override **to** Sinus Tachycardia (120)
set **Wedge Pressure** **to** 5 mm Hg
set Fixed Heart Rate **to** 130 beats/min **over** 30 seconds
set Eyes: Blink Control **to** Eyes Closed
▼*Transitions*
if Time in State = 60 seconds **then go to** *Mild_ischemia*
▼Mild_ischemia
▼*Events*
set Cardiac Rhythm Override **to** Myocardial ischemia (mild)
▼*Transitions*
if Time in State = 180 seconds **then go to** *vtach_a*
▼vtach_a
▼*Events*
set Cardiac Rhythm Override **to** Ventricular Tachycardia
set Fixed Heart Rate **to** 810 beats/min
▼*Transitions*
if Defibrillation ≥ 150 Joules **then go to** *sinus_tach_145b*
▼sinus_tach_145b
▼*Events*
set Fixed Heart Rate **to** 130 beats/min
set Cardiac Rhythm Override **to** Myocardial ischemia (moderate)
▼*Transitions*
if Time in State = 120 seconds **then go to** *vtach_b*
▼vtach_b
▼*Events*
set Fixed Heart Rate **to** 200 beats/min
set Cardiac Rhythm Override **to** Ventricular Tachycardia
▼*Transitions*
if Defibrillation ≥ 350 Joules **then go to** *Trans_to_PEA*
▼Trans_to_PEA
▼*Events*
set Cardiac Rhythm Override **to** Sinus Tachycardia (120)
set Fixed Heart Rate **to** 50 beats/min **over** 30 seconds
▼*Transitions*
if Time in State = 60 seconds **then go to** *PEA*
if Time in State = 30 seconds **then set** Cardiac Rhythm Override **to** Sinus Bradycardia
▼PEA
▼*Events*
set Cardiac Rhythm Override **to** PEA
set Fixed Heart Rate **to** 20 beats/min **over** 1 minute(s)
▼*Transitions*
if Time in State = 60 seconds **then set** Cardiac Rhythm Override **to** Asystole

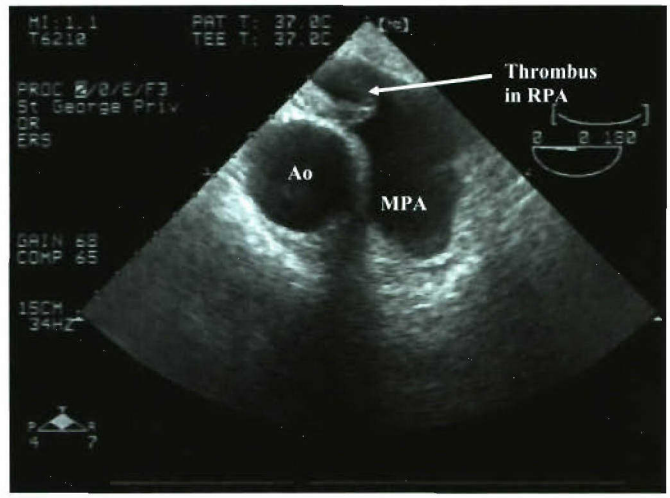

FIGURE 1. Thrombus visible in right pulmonary artery. Ao, aorta; MPA, main pulmonary artery; RPA, right pulmonary artery. Reprinted with permission from Dr. D.A. Pybus.

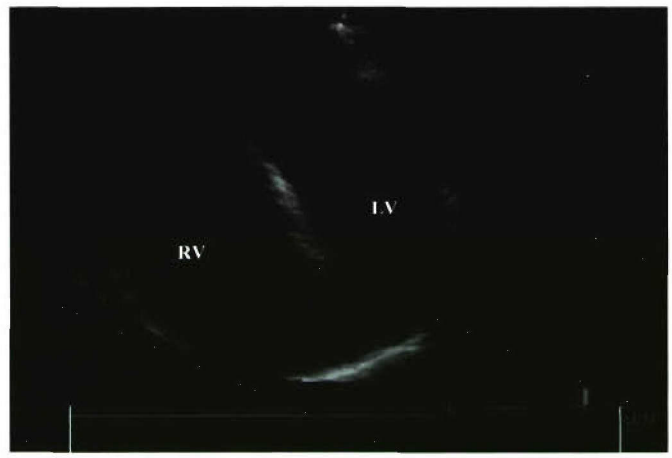

FIGURE 2. Right ventricle (RV) is distended and overfilled (volume overload). Note that the apex of the RV extends all the way to the apex of the left ventricle (LV). There is minimal septal shift leftward. Reprinted from Sidebotham et al. with permission from Elsevier.

DISCUSSION

Echocardiographic images are excellent tools to demonstrate normal cardiac physiology to anesthesiology residents.[10] These images clearly show, for example, valvular movement and function, the role of atrial contraction in ventricular filling, myocardial contractility, cardiac chamber volume status, and cardiorespiratory interaction. A thorough understanding of normal physiology forms the basis of understanding and recognizing abnormal states. Echocardiographic images also visually demonstrate real time hemodynamic cause and effect.[10] The picture of a swinging heart as seen in tamponade, the right-sided cardiac chamber dilatation and opening of a patent foramen ovale, paradoxical embolization of thromboembolism, and right-to-left shunting during pulmonary embolization should leave a clear impression in

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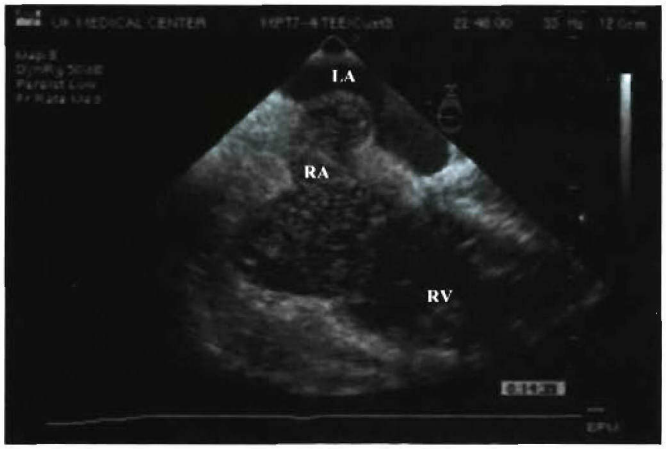


FIGURE 3. Increased right atrial (RA) pressure with bulging of the inter atrial septum towards the left atrium (LA). Note presence of thrombus in RA.

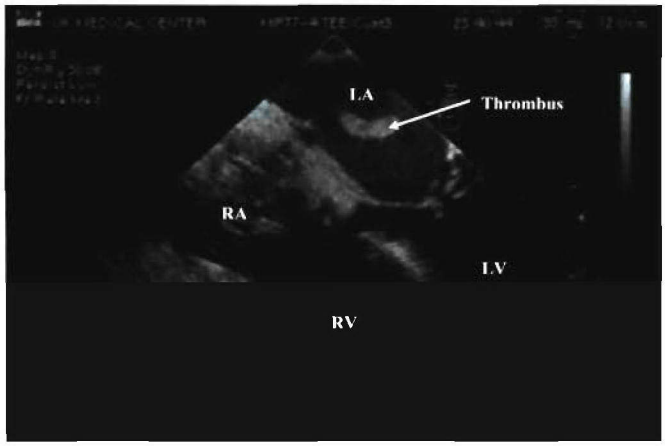


FIGURE 4. Paradoxical embolism across a patent foramen ovale (PFO). This can occur in patients with a patent foramen ovale (present in about 20-25% of the general population) when the right atrial (RA) pressure increases to above that of the left atrium (LA) resulting in flow across the PFO. Note residual thrombus still present in RA.

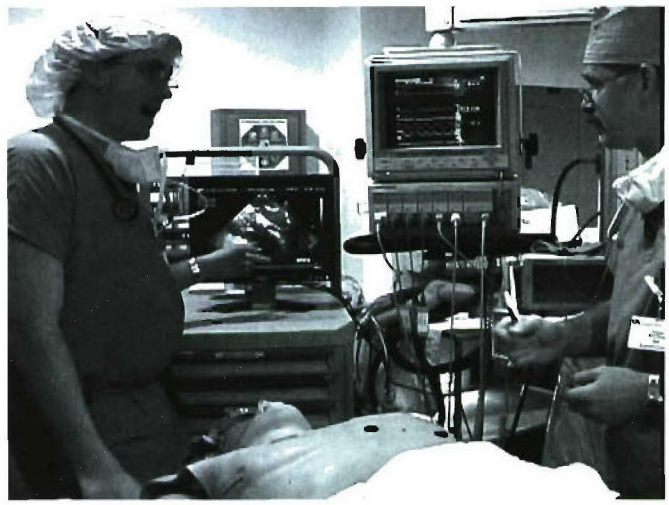
the minds of anesthesiology residents. This report describes the integration of these echocardiographic images into the PS to facilitate anesthesiology resident education in situations with an abnormal pressure-volume relationship.

When selecting echocardiographic images to use within the training and testing sessions, specific images were chosen because they were recognizable to most residents within anesthesiology training programs. Also, because anesthesiologists are increasingly using transesophageal echocardiography (TEE) intraoperatively, TEE images were chosen during the image search. Certain intrathoracic structures, however, may be more clearly viewed with transthoracic echocardiography (TTE), and echo image collection for the PS database has begun for TTE as well. This should allow greater image selection options for future didactic and testing sessions.

Images were also chosen to demonstrate orientation planes with easily identifiable structures for the didactic sessions. These included two dimensional images in the long axis, short axis, Doppler flow, and M-mode. Additionally, specialized views were selected for senior anesthesiology residents from whom greater orientation to echocardiography was expected.

During the didactic and testing sessions, the instructor should be intimately familiar with the images and their location within the PowerPoint slideshow presentation. During the sessions, occasionally images were shown in a different sequence to reinforce specific information or to answer important questions. It was helpful under these situations to have a paper list of the available images and the salient points of each image along with the corresponding slide number for that image. Throughout the training and testing sessions, a simulator technician trained in the use of the METI PS was used. The responsibility of this technician was to provide correct operation of the PS program, thereby, allowing the session instructor to direct the simulator session, to select and display the appropriate echo images, and to explain the important pathophysiologic changes of the various disease states.

There were several limitations of echo imaging during PS training and testing scenarios. For example, the use of a single screen for both the instructor and the residents was inappropriate because this required both the instructor and the residents to use the same screen for both image selection and image visualization. Eventually a system was chosen where the instructor operated the Powerpoint slideshow from a dedicated "instructor" screen (in our case, we used a laptop computer) and the residents viewed echocardiographic images on a second screen (in our case, an added display screen placed next to the standard PS patient monitor; see Picture 1). This was accomplished by switching images with selective transfer of echo data via an extended Video Graphic Array (VGA) cable between the instructor's and the residents' monitors. For example, only the resident monitor screen was used by the residents to view the relevant echo images. The instructor's screen was blocked from the residents' view



PICTURE 1. Placement of remote echo monitor as used by the authors.

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during these sessions. During echo image selection, the residents' screen was blackened while the instructor selected (from the instructor's screen) the next relevant image. When the image was selected the resident's screen was allowed to be visible again. All images remained accessible on the instructor's screen throughout the didactic and testing sessions. In this system, the instructor switched the screen by simply depressing a keyboard sequence which was built into the laptop hardware.

Another limitation of the use of echo is the inability to synchronize images with the simulated patient's heart rate. As a didactic tool, residents reported that this did not affect the training session or their understanding of the underlying pathophysiology. Synchronizing echo images to the PS heart rate would be complex, requiring an electrocardiographic signal from the PS (for example, the R-wave from the ECG) to trigger the start of the echo image. Additionally, data regarding the R-R interval would be necessary to regulate the length of single cardiac cycle image duration. Further, synchronization would require variable speed playback to correlate with PS heart rate changes. Image loop duration of greater than a single cardiac cycle would add even greater complexity to this system. The interface between echo image display and PS heart rate is not currently available to us; however, PS manufacturers and programmers should consider incorporating this technology into future PS product lines.

Currently, echo images and PS simulation scenarios have been created for a number of pathophysiologic conditions with serious effect on the cardiovascular system, including acute pulmonary embolism, cardiac tamponade, systolic and diastolic myocardial dysfunction, post myocardial infarction valvular dysfunction and ventricular septal defect, hypovolemia, left ventricular outflow tract obstruction and conditions with low systemic vascular resistance, for example sepsis. Many of these disease states do not commonly occur in normal patient populations, and, additionally, echocardiography may not be considered the diagnostic test of choice for some of these disease states. The use of echo images in these disease states serves to underline the objectives, which were to use echocardiography (and visual cardiac information) as a teaching tool to better understand the pathophysiologic changes associated with these conditions and to use echo to assist in the interpretation of the invasively obtained pressure data.

Importantly, it was not the intention to teach echocardiography to anesthesia residents per se, but rather to use it as an illustrative tool for normal and abnormal physiology and to correlate the visual images with monitored hemodynamic pressures. As such, no simulated or real TEE probes were placed during training or testing simulations, nor was specific echo probe manipulation required to obtain the requested images.

Currently, echocardiographic images used in these scenarios are stored and generated from a laptop computer. A web-based module is in development. This module will have a central database of echo images with the appropriate images preselected and organized into specific scenarios for easier use during both didactic and testing scenarios.

In this report, the incorporation of echocardiographic imaging into PS training of anesthesiology residents is described. This simulation strategy is described because there are certain disease states that disrupt the normal cardiac pressure-volume relationship which may be better demonstrated using the combination of echocardiographic imaging and PS. Several scenarios were developed to depict both rare and common disease states and didactic and testing session based around these scenarios was developed for anesthesiology residents. In the future, the addition of echo images to PS may also be useful in the training and testing of residents in other disciplines, medical students, nurses, nursing students, and other applicable health care providers.

ACKNOWLEDGMENTS

The authors thank Terry Evans for his technical assistance with the preparation of the echocardiographic images used in this simulation, Lauren De Beer for her editorial assistance, and Darrin Burchell for his assistance with simulator programming.

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Abstracts presented at the 6th Annual International Meeting on Medical Simulation

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AWARD WINNERS

Resident Award #1379

The Value of Debriefing in Simulation-based Education: Oral versus Video-assisted Feedback.

Georges L Savoldelli, Viren N Naik, Jason Park, Hwan S Joo, Roger Chow, Patricia L Houston, Stanley J Hamstra
St. Michael's Anesthesia Research into Teaching (SMART) Simulation Group, Department of Anesthesia, St. Michael's Hospital and the Wilson Centre for Research in Education, University of Toronto, Toronto, Ontario, Canada

EDUCATION CATEGORY

1st Place #1462

Cricothyroidotomy Simulator with Haptic and 3D Visual Feedback.

Alan Liu, Yogendra Bhasin, Eric Acosta, Gilbert Muniz, Mark Bowyer
National Capital Area Medical Simulation Center

2nd Place #1487

Resident Self-Efficacy Assessment is Poorly Correlated with Simulation Performance.

Mark D Adler[1], Jennifer L Trainor[1], Viva Jo Siddall[2], William C McGaghie[3]
[1]The Departments of Pediatrics, [2]Anesthesia, and, [3]Medical Education and Preventive Medicine, The Feinberg School of Medicine of Northwestern University

3rd Place #1545

Evaluation Of A Mobile 'In-Situ' Simulation Training Course For Teams (Paramedics And Doctors) In Wing-Based Emergency Air Rescue And Intensive Care Transport Using Subjective Pre-Post Competency Rati.

Marcus Rall[1], Peter Dieckmann[1], Silke Reddersen[1], Eric Stricker[1], Joerg Zieger[1], Gerson Conrad[2]
[1]Center for Patient Safety and Simulation (TuPASS), Dept of Anesthesia & Intensive Care, University Hospital Tuebingen, Germany, [2]German Air Rescue (DRF), Filderstadt, Germany

PATIENT SAFETY CATEGORY

1st Place #1448

Development of High Fidelity Simulations for Exploring Surgical Stress.

Cordula M Wetzel[1], Stephen A Black[1,2], Debra Nestel[1], Maria Woloshynowych[1], John HN Wolfe[2], Ara Darzi[1], Roger L Kneebone[1]
[1]Division of Surgery, Oncology, Reproductive Biology and Anaesthesia, Imperial College London, UK, [2]St Mary's Hospital London Regional Vascular Unit, UK

2nd Place #1432

A Comparative Study Of Coordination Processes Related To Different Levels Of Performance During A Simulated Anesthetic Crisis.

Tanja Manser, T. Kyle Harrison, Steven K. Howard, David M. Gaba
VA Palo Alto Health Care System

3rd Place #1395

The Use of a Cognitive Aid During Simulated Pediatric Cardiopulmonary Arrests—An Observation of 60 Mock Codes.

Kristen L Nelson[1,2], Nicole A Shilkofski[1,2,3], Jamie Haggerty, Elizabeth A Hunt[1,2,3]
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TECHNOLOGY & SIMULATION CENTER OPERATIONS

1st Place #1560

A Novel Debriefing Tool: Online facilitator guidance package for debriefing team training using simulation.

Michael DeVita[1,2], John Lutz[1], Nicolette Mininni[1,2], Wendy Grbach[2]
[1]Winter Institute for Simulation Education and Research, University of Pittsburgh, [2]UPMC Health System

2nd Place #1488

The Tumor: A Simulator for Open Surgery.

William Berry[1,3], Daniel Raemer[2,3]
[1]Massachusetts General Hospital, Department of Anesthesia, [2]Department of Anesthesia, Harvard Medical School, [3]Risk Management Foundation of the Harvard Medical Institutions

3rd Place #1516

Training on the Virtual Reality Simulator CATHI Improves the Procedural Skills in Novices of Coronary Interventional Procedures—An Experimental Study Using a Pulsatile Coronary Flow Duplicator.

Wolfram G Voelker[1], Jan Coburger[1], Andreas Bonz[1], Martin Laser[1], Juergen Hesser[2]
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Elissa Schechter Yale New Haven Hospital New Haven CT

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Jochen Vollmer Simulationszentrum Mainz Mainz RLP Germany

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Leonard Wade Northwestern University Chicago IL

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Kristine Larison Portland OR

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Michael Devita University Of Pittsburgh Pittsburgh PA

100 1415 Identification Of Human Factors Elucidated During Obstetrical Team Training Using High-Fidelity Simulation

Pamela Morgan Sunnybrook & Women's College HSC Toronto ON Canada

102 1460 The Development Of A Role-Playing Simulation To Investigate Coordination Of An OR Master Schedule

Suzanne Weisband University Of Arizona Tucson AZ

103 1497 Applying Learning Object Principles To Simulation: The Anesthesia Machine Pre-Use Check

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104 1505 All Aboard, Let's Go: How To Bring Your Coworkers To The Sim Side

Mindi Anderson University Of Texas At Arlington Arlington Texas

Editor's Note: FULL ABSTRACTS are arranged numerically by the Abstract #. Refer to the Abstract Listing Pages for the Abstract # that corresponds to the - POSTER BOARD #. Abstracts are presented as they were submitted except for minor formatting. Conflict of Interest statements located at the bottom of each abstract.

ABSTRACT # 1365 - POSTER BOARD # 31

Trauma Simulation Drills in the Resuscitation Unit: The Challenge of Improving the Performance of the Constantly Changing Trauma Teams

Zmora Zohar,[1] Igor Waksman,[2] Shimon Ivry,[3] Jack Stolero,[1] Dvora Avital,[1] Arieh Eitan[2]; Western Galillee Hospital Nahariya Israel. [1]Emergency medicine, [2]Surgery, [3]Anesthesia

INTRODUCTION: The initial management of the trauma victim is difficult and stressful, and can easily overwhelm the attending staff. Rapid and appropriate response is crucial for life saving and prevention of severe and long-term disabilities. The objective of the present study was to improve the individual and team performance of personnel in the trauma unit using simulation drills.

METHODS: Before and after participating in at least two trauma simulation drills in the emergency department, participants completed a questionnaire appraising their performance in the resuscitation unit: familiarity with resuscitation activities such as intubation, chest tube insertion or central line insertion, and overall competence, as well as leadership and teamwork.

A senior surgeon and the trauma coordinator nurse in the trauma unit have conducted 40 trauma simulation drills over the last 4 years, using a simulation mannequin (SIM 4000, Laerdal). It allowed practice of airway management, including endotracheal intubation, insertion of IV lines, pelvic and limb fixation. External injuries were depicted by make-up. The common clinical scenarios included severe multiple trauma requiring urgent intervention and prioritizations: stab wounds, gun shot wounds, fall from height, pedestrian road accident, motorcycle accident and motor vehicle explosion. The trauma teams practiced simultaneous management of more than one severe trauma patient. Participants in the simulation drills included residents in surgery, orthopedics and anesthesia, and nurses assigned to the emergency department. The simulations were videotaped and were the basis of debriefing and conclusions immediately after the exercise. Statistical workup was done using the Mann-Whitney and the Wilcoxon matched pairs tests.

RESULTS: The pre-post response of 33 participants in such simulations indicated significant self-appraised improvement of skills following the simulation drills. Especially notable were improvement of drain insertion ($p=0.004$), fixation of cervical spine ($p=0.04$), management of complex trauma ($p=0.02$), and in overall ED performance ($p=0.01$). The effect was more pronounced for physicians than for nurses. All participants felt that the exercises contributed, at least partly, to their ED performance.

CONCLUSIONS: We believe that trauma simulation drills are the key for improving management of real trauma emergency resuscitation immediately upon patient arrival at the ED. These drills examine the level of knowledge, skills, and ability. They are performed in the environment familiar to the participating staff and entail scenarios of everyday trauma. These facts contribute to a serious and cooperative attitude of the participants, and make the drills efficient and advantageous. While it is difficult to estimate the actual contribution of the simulation trauma drills to the performance with real injured patients, our analysis of self-appraisal enabled us to focus on four topics which were significantly improved by these exercises, and to exclude other topics which needed no further improvement.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1371 - POSTER BOARD # 1

A Multi-Institutional Pilot Study to Evaluate the Use of Virtual Patients to Teach Health Professions Students History-Taking and Communication Skills

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BACKGROUND: At many institutions, health professions students learn communication skills through the use of standardized patients (SP), but SPs are time and resource expensive. Virtual patients (VP) may offer several advantages over SPs but little data exist regarding the use of VPs in teaching history–taking and communication skills. Medical educators and computer scientists have created an interactive virtual clinical scenario of a patient with acute abdominal pain. Preliminary studies from the University of Florida (UF) demonstrate that the virtual scenario may be useful in teaching health professions students history-taking and communication skills.

OBJECTIVE: To assess the feasibility of implementing and evaluating this innovative virtual educational tool at a second institution, the Medical College of Georgia (MCG). Methods: Medical and Physicians Assistant Students at UF ($N=23$) and MCG ($N=31$) volunteered to evaluate the virtual system. In the scenario, a life-sized VP is projected on the wall of an exam room in SP teaching and testing centers at MCG and UF (Figure 1). A virtual instructor (VI) provided the student with some background information and the goal of the virtual scenario and, after 10-minutes, he asked the student for their differential diagnosis. Students conversed with the VP via a commercially available speech recognition engine (Dragon Naturally Speaking Professional). Students were evaluated on their ability to: 1) ask the VP 12-core questions taken from an abdominal pain OSCE station checklist and, 2) to generate a differential diagnosis. In addition, immediately following the virtual scenario, students completed a validated SP questionnaire (Maastricht Simulated Patient Assessment) (Table 1). Data=Mean±SD. Data analyzed by Students t-test.

CONCLUSIONS: A virtual clinical scenario to teach health professions students history-taking and communication skills was successfully installed and evaluated at two institutions (MCG and UF). MCG students were more junior in their training and therefore had fewer SP interactions than the UF students. Despite students lower overall evaluation of VPs compared to SPs, there was no difference in students asking 12-core questions and generating a differential diagnosis between the groups. As technology matures, virtual clinical scenarios will provide students a controllable, secure, and safe learning environment with the opportunity for extensive repetitive practice with feedback without consequence to a real or SP.

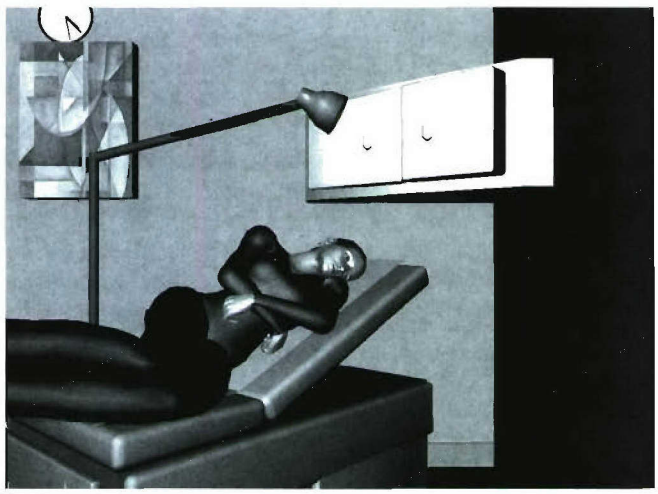

Table 1. Comparison of Virtual Patient (VP) and Standardized Patient (SP) Interactions

Survey Statement Response	UF-VP	MCG-VP	SP
Months in School	31.43±8.03*	18.76±8.76	
Previous SP Interactions	17.08±5.23*	6.00±4.74	
The VP/SP appears authentic.[1]	4.48±0.35	3.73±0.71	5.00±0.00
VP/SP stimulates the student to ask questions.[1]	4.13±0.99	3.00±1.10	3.12±1.64
I would use this tool to practice my clinical skills.[1]	4.78±1.06	3.81±0.88	4.87±0.35
Overall Evaluation. [2]	6.56±1.16	6.23±0.95	9.50±0.53**
Core Questions Checklist. [3]	7.04±1.10	6.42±1.33	6.75±1.03

[1] Five-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). [2] Ten-point scale (1 = lowest, 10 = highest). [3] Twelve-item core questions. *p< 0.05 versus MCG-VP. **p<0.05 versus UF-VP and MCG-VP.

DISCLOSURE:

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Grant support	University of Florida COMEC Grant

ABSTRACT # 1379 - POSTER BOARD # 2

The Value of Debriefing in Simulation-based Education: Oral versus Video-assisted Feedback

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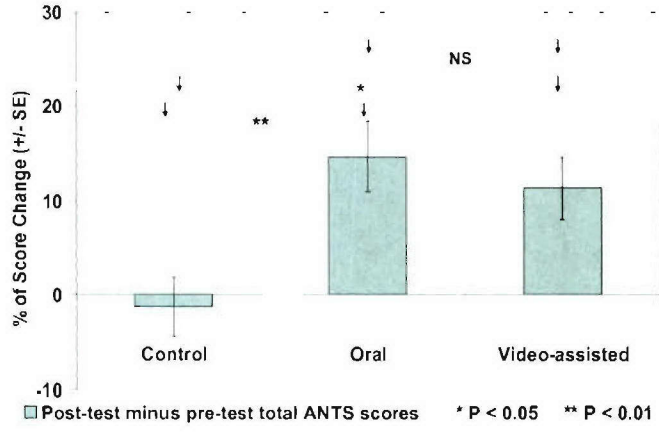
BACKGROUND: The debriefing process during simulation-based education has been poorly studied despite its educational importance. Videotape feedback is an adjunct that may enhance the impact of debriefing and in turn aid in maximizing learning. The purpose of this study was to investigate the value of the debriefing process during simulation and to compare the educational effectiveness of two types of feedback: oral feedback without videotape review of the performance versus oral feedback with videotape review.

METHODS: Forty-two anesthesia residents were pre-tested during a crisis scenario using a SimMan™ Simulator (Laerdal Medical Canada Ltd., Toronto, Ontario). Participants were randomly assigned to receive no debriefing (control), instructors' feedback (oral), or videotape-assisted instructors' feedback (video-assisted). The debriefing focused on non-technical skills guided by crisis resource management principles. Participants were then required to manage a post-test scenario. The videotapes of all performances were later reviewed by two blinded assessors who rated participants' non-technical skills using the ANTS scale, a validated scoring system (1). The mean changes in score were analyzed using ANOVA and Tukey's test for post-hoc comparisons.

RESULTS: Participants' non-technical skills did not improve in the control group whereas the provision of verbal feedback, assisted or not with videotape review, resulted in significant improvement ($p < 0.005$). There was no significant difference in score changes between the oral and video-assisted feedback groups (see Figure).

CONCLUSIONS: Mere exposure to a simulated crisis appears to offer little benefit to trainees.



Constructive feedback on the initial performance provided by instructors is paramount and highly effective. The addition of video review did not offer any advantage over verbal feedback alone. Valuable simulation training can therefore be achieved even when video technology is not available.

1) Br J Anaesth 2003 , 90 (5) : 580- 8.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1380 - POSTER BOARD # 78

Clinical Simulation: Caring for a Critically Ill Patient with Sepsis

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PURPOSE: The purpose of this simulation research was to assess whether experienced critical care nurses could better apply currently recommended therapeutic interventions for patients with sepsis by using a horizons trends clinical decision support tool, rather than just standard monitoring screen shots alone.

METHODS: Simulation research participants (N=29) were first required to attend a didactic training session focusing on recognition and evidence-based treatment for critically ill patients with sepsis. Participants were then directed to apply these treatments in a simulated sepsis experience. Participants were brought into the simulation lab in a large booth at the National Teaching Institute Critical Care Nursing Conference, New Orleans, May 2005. A METI HPS (human patient simulator) was connected to a Philips Medical Systems Intellivue MP 90 and a Nellcor-Puritan-Bennett ventilator in a simulated critical care environment. Participants were given the patient history, and completed the rest of their assessment using the HPS and Intellivue patient monitoring. Data were collected to compare the use of bedside monitor displays with and without horizon screen trends in the care of patients with sepsis. Group 1 completed the sepsis scenario using a standard screen display, and group 2 had the addition of horizon trends on the display.

RESULTS: Table 1 highlights the differences between the 2 groups. The point that marked the ***onset of sepsis*** was when each of the physiologic parameters met the current evidence-based screening criteria The mean time to get to every therapeutic decision point was shorter in Group 2 than in Group 1.

CONCLUSIONS: While the number of participants was too low to reach statistical significance, results of this pilot study support the hypothesis that the use of horizons screen trends assisted the clinicians in making more rapid clinical decisions.

Table 1. Group Comparisons for Initiation of Appropriate Sepsis Treatments

	Group 1 (N=13) with Screen Shots Only		Group 2 (N=16) with Horizons	
Therapeutic endpoint:Time (in minutes) between onset of sepsis and initiation of:	Mean	(SD)	Mean	(SD)
fluid bolus	3.02	(1.6)	2.7	(1.5)
vasopressor	5.7	(1.6)	4.3	(1.2)
blood culture order	5.3	(.8)	4.7	(1.2)
antibiotic order	6.6	(.6)	5.5	(.5)

DISCLOSURE:

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Employee	Philips Medical Systems (Giuliano and Johannessen)and METI (Leighton)

ABSTRACT # 1383 - POSTER BOARD # 47

Non Technical Skills: The Effect of Experience in Anesthesia Trainees

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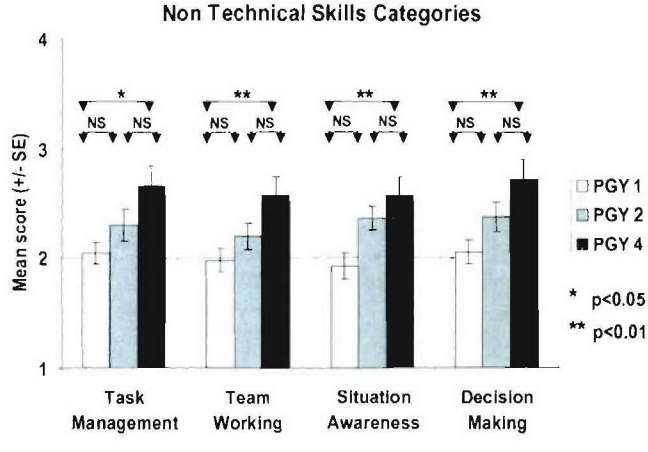
BACKGROUND: Anaesthetists' Non Technical Skills (ANTS) encompass cognitive and behavioral skills such as task management, team working, situation awareness and decision making (1). It is believed that these qualities are acquired during residency by observing role models and therefore improve with experience. Simulation may also be the ideal setting to teach, reflect and practice these qualities (2). Objectifying these skills is therefore informative from an educational standpoint. This study investigated the effect of the level of training on the non technical skills of anesthesia residents.

METHODS: The performances of 15 first year (PGY1), 15 second year (PGY2), and 12 fourth year anesthesia (PGY4) residents were videotaped during a crisis scenario using a SimMan™ Simulator (Laerdal Medical Canada Ltd., Toronto, Ontario). The tapes were later reviewed by two blinded assessors who rated participants' performances using a previously validated scale (ANTS scoring system) that assesses non technical skills (1). The mean total ANTS scores and the mean scores in each category of the scale were analyzed using ANOVA according to the level of training. Post-hoc comparisons were performed using Tukey's test.

RESULTS: There was a significant overall difference among the three groups ($p<0.01$). Post-hoc analysis revealed that fourth-year residents' total ANTS scores were higher than first-year residents' scores ($p<0.01$), but did not differ from second-year residents ($p=0.21$). Scores between first and second-year residents did not differ ($p=0.22$). Mean ANTS scores at the categories level followed a similar pattern (see Figure).



CONCLUSIONS: Our results suggest that non technical skills of anesthesia residents increase with experience. However, the variability in performances was important within a given level of training; therefore, scores only significantly differ between very junior and senior residents. Formative evaluations using the ANTS system, either during simulation or during clinical practice, may prove useful to follow trainees' improvement and to provide them with constructive feedback.

1) Br J Anaesth 2003; 90 (5). 580–8.

2) Anesthesiology 2005; 103 (2). 241–8.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1387 - POSTER BOARD # 74

The 2-year experience of new simulation-based airway management training protocol for junior physicians – Advanced Airway Life Support in Taiwan

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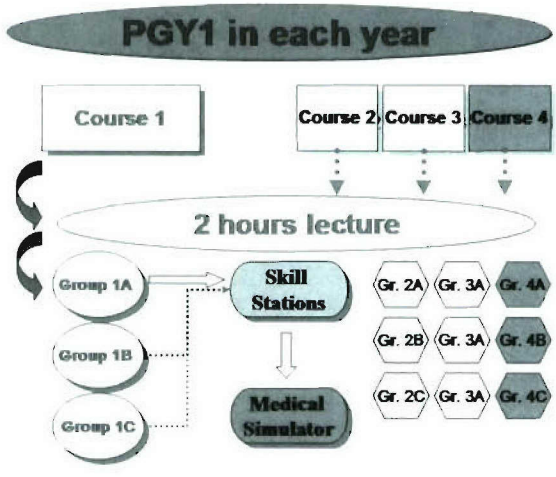
TITLE: The 2-year experience of new simulation-based airway management training protocol for junior physicians – Advanced Airway Life Support in Taiwan Authors: Pin-Tarng Chen, MD1, Ying-Che Huang, MD1, Huey-Wen Yien, MD PhD1, Cho-Yu Chan, MD2, Cheng-Deng Kuo, MD PhD3, Kwok-Han Chan, MD1.

INSTITUTE: Department of Anesthesiology1, Clinical Skills Resources Center (CSRC)2, Department of Research and Education3, Taipei Veterans General Hospital

AIM OF INVESTIGATION: A new training and education post-graduate year 1 (PGY1) program for junior physicians was developed 2 years ago after Severe Acute Respiratory Syndrome (SARS) attack in Taiwan. Advanced Airway Life Support (AALS) is the airway management training protocol for PGY1. We report the current status of using skill workshops and medical simulator of AALS in our hospital.

METHODS: The junior physicians in our hospital were all enrolled into the PGY1 course. They spent 3 months of the first year for PGY1 training. In each course, they must participate in the AALS. After 2 hours' lecture of general principle and introduction of instruments, they were divided into 3 groups for 4 hours' skill workshops and medical simulator training in Clinical Skills Resources Center at different times. In each group, they really practiced the skills at 10 stations of airway workshop. After that, the standardized human patient simulator (SimMan, Laerdral) was operated to simulate the realistic clinical situations by using more than two programmed scenarios (according to the difficult airway management algorithm modified from ASA according to our hospital resources and ACLS guidelines). In each scenario, they must pass all performance check points. Video-based debriefing and feedback were made after each simulation. The questionnaire about AALS was collected 3 months after they finished PGY1 course.

RESULT: This AALS program has been developed for two years. Till now, 399 physicians had been trained with full protocols. The questionnaire revealed that the AALS training program was useful. They improved their spirit of leadership, techniques and ability of decision making, and they gained more confidence in resuscitation and airway management after participating in medical simulation.



CONCLUSIONS: Teaching airway management skills, especially for the difficult airway and protection of personnel, continues to be an important issue in Taiwan. The AALS training program provides methodical and systematic training. We speculate that the AALS is invaluable, especially for new beginner to grow to maturity with specialized technical skills and higher-order cognitive skills, behaviors and leadership in airway management. Furthermore, the results of using the medical simulator based training combined with AALS and ACLS for PGY1 airway management training are inspiring. This program will be continued and modified for other training systems.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1391 - POSTER BOARD # 79

Management of Simulated Oxygen Supply Failure: Is There a Gap in Curriculum?

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BACKGROUND: The routine checking and maintenance of anesthesia equipment is a task that is increasingly being delegated to non-physician personnel. Subsequently, anesthesia trainees may not have exposure to this everyday practice. This could result in a diminished ability to manage an equipment-related crisis, which may compromise patient safety. High-fidelity patient simulation provides a safe environment to identify gaps in a trainee's knowledge and clinical performance. We conducted this study to evaluate the management of a simulated oxygen pipeline failure in our residency program.

MATERIAL AND METHODS: Twenty participants were videotaped while they managed an oxygen pipeline failure during a simulated carotid endarterectomy. The reserve O2 cylinder on the anesthesia gas machine was empty. If a new O2 cylinder was not requested by the subject, one was delivered, and the candidate was prompted to change the reserve O2 cylinder. At all times a self-inflating resuscitation (Ambu®) bag was available to ventilate the patient's lungs. The videotapes were scored by two staff anesthesiologists using a performance checklist.

RESULTS: 12 fourth-year (PGY4) and 8 second-year (PGY2) anesthesia residents participated in the study (Table 1). Fourth year residents did not perform significantly better than second year residents (all p=NS).

CONCLUSIONS: Our results suggest that the understanding and management of oxygen supply failure was deficient among relatively experienced residents at our institution. We suspect that the delegation of gas machine maintenance to perioperative personnel has created a new gap in knowledge. Our results also demonstrate that simulation-based programs that are integrated into the residency can identify gaps in trainee education, and provide useful feedback for responsive curriculum modification and improvement.

Proportion of Key Actions Performed

Key Action	PGY2 (%) n=8	PGY4 (%) n=12	Total (%) n=20
Recognizes the O2 supply and pressure alarms	37.5	41.7	40.0
Opens the O2 cylinder on the machine	50.0	50.0	50.0
Recognizes that O2 cylinder is empty	37.5	50.0	45.0
Calls for a new O2 cylinder	50.0	66.7	60.0
Changes the O2 cylinder successfully	37.5	41.7	40.0
Ventilates patient with the Ambu bag	100	91.7	95.0
Anticipates patient awakening	37.5	41.7	40.0

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1392 - POSTER BOARD # 89

Simulation Props: Enhancing Realism on a Budget

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SUCTIONING WITHOUT THE "BLOODY" MESS We developed a "dry" suction system, to add an element of realism while protecting the patient simulator from exposure to liquid damage. This system has a self feeding "blood" supply, and needs to be attached to an active suction source. Blood can be seen and heard being suctioned from the patient simulator, into a suction canister.

MATERIAL AND METHODS: -Yankauer suction, suction tubing, 3-way stopcock, a pressure infuser bag, a suction source, a 500ml IV solution bag infused with red dye, IV tubing with a Luerlock adapter, stiff monitoring tubing with a Luerlock .

1) Make a short incision into the suction tubing approximately 3' from the end and attach the Yankauer catheter.

2) Attach the stopcock to the monitoring tubing and cut off the adapter on the other end. Lubricate the cut end and feed it through the incision of the suction tubing till you are about ½ inch from tip of Yankauer.

3) Take the 500ml IV bag with red dye. Attach IV tubing and place in the pressure infuser bag. Attach the IV tubing to the stopcock attached to the monitoring tubing.

4) Attach to suction and turn on. Apply pressure to the bag and open up the stopcock. "Blood" will flow to tip of the catheter fed from the monitoring line inside the suction tubing, and will then be suctioned back into the suction cannister.

Cuts and Bruises: Cheap and Easy We developed these wounds to add an element of realism with the versatility of placing them anywhere on the simulator.

MATERIAL AND METHODS: -Craft paints for painting on plastic or glass

1) Purchase a tube of clear (colorless) transparent paint, and squeeze some onto a small sheet of glass, plastic, or disposable palette the approximate size of a desired bruise or cut. Squeezing it out from the tube you will get a blob of white paint that will dry transparent and colorless. Gently tap or vibrate the surface to flatten out the blob. This will be your base onto which you paint the wound.

2) Allow 24 hours to dry.

3) Now use any brand of acrylic paints to create a wound onto the base. Paint your wound transparently (with thinned out paints), so when you place the wound, the simulator flesh color will show through in varying degrees. The transparency will create a natural blending making the wound more realistic.

CONCLUSION: These designs were made at a low cost with minimal effort. They have enriched the realism of our simulations, and improved efficiency between scenarios.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1395 - POSTER BOARD # 85

The Use of a Cognitive Aid During Simulated Pediatric Cardiopulmonary Arrests- An Observation of 60 Mock Codes

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BACKGROUND: Morbidity and mortality associated with pediatric cardiopulmonary arrests is exceedingly high. Management of pediatric arrests is challenging due to the complexity of medication dosages related to variation in patient weights and lack of experience due to infrequency of events. Use of cognitive aids may assist in making rapid and accurate decisions in these critical situations; however, there are few reports on how these aids are utilized during arrest management and on whether they impact quality of care.

OBJECTIVE: 1.)Document the proportion of residents that possess and utilize cognitive aids during simulated cardiopulmonary arrests, i.e. "mock codes" 2.) Delineate the types of cognitive aids possessed and the manner in which they are used. 3.) Identify errors made during resuscitation efforts that may be related to the cognitive aid design.

METHODS: Observation, descriptive study. Sixty pediatric residents participated in individual mock codes with a high fidelity simulator, during annual competency assessments. each mock code included a standardized scenario that involved pulseless ventricular tachycardia and pulseless electrical activity (PEA), requiring the use of two separate algorithms based on American Heart Association (AHA) guidelines. The possession, utilization and type of cognitive aid used during these scenarios was documented.

RESULTS: 56/60 (93%) of pediatric residents possessed at least one cognitive aid, while 55/60 (92%) actually utilized the card. The types of aids possessed were: institutionally created card- 41/60 (68%), Pediatric Advanced Life Support (PALS) card issued by the AHA- 38/60% (63%), self-created card- 4/60 (7%) and 25/60 (42%) of residents possessed more than one aid. Of those who actually used a cognitive aid , 30/55 (55%) used an institutionally created card, 55% used a PALS card and 7/55 (13%) used more than one aid. 48/55 (87%) of residents used cognitive aids for assistance with algorithms, 5/55 (9%)used cognitive aids for medication dosage, and 2/56 (4%) used cognitive aids to determine ratio of chest compressions to ventilations needed. Unfortunately, a tendency for residents to choose the wrong treatment algorithm while looking at the cognitive aids was noted. This appeared to be related to the layout of the cards. While using the AHA-PALS card, several residents chose the "tachycardia with poor perfusion" algorithm rather than the appropriate "pulseless ventricular tachycardia" algorithm. This resulted in the use of synchronized cardioversion instead of defibrillation and administration of epinephrine. Furthermore, there was a tendency of residents to use all cognitive aids to help them remember the underlying causes of PEA rather than starting chest compressions or asking for epinephrine, with an associated delay to initiation of Basic Life Support.

CONCLUSION: Mock codes reveal that a large proportion of pediatric residents possess and utilize cognitive aids during cardiopulmonary arrests. Unfortunately, recurrent patterns of errors and delays in appropriate therapy were noted. Further study is required to determine if errors are in fact associated with the layout of cognitive aids and whether improving the layout of cognitive aids can help minimize errors in Basic Life Support and ultimately improve patient outcomes.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1396 - POSTER BOARD # 75

An investigation into the use of simulation and clinical skills training in the students' preparation for practice

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INTRODUCTION: There is a recognition that many students are reaching qualification without ever becoming proficient in some basic competencies at both psychomotor and higher cognitive levels (Scott 2001). Students nowadays are increasingly expected to have acquired more and more technical skills by the time they qualify, however, there has been much concern about the ability of students to perform essential psychomotor skills, such as the monitoring of blood pressure and injection technique. In response to this, simulation and clinical skills centres are being developed across the country in order to change the way in which the teaching and learning of clinical skills takes place (Bradley & Postlewaite 2003). Experiential learning through simulation and clinical skills is an essential component of nurse education in the United Kingdom (Alinier et al 2005). However, with the Widening Participation Agenda in Higher Education bringing an increasing number of students (DfES 2003), but comparatively less facilitation resources, it is becoming more and more difficult to allow all students to benefit from the same exposure of appropriate training. The overall aim of this project is to critically evaluate the perceived value of simulation and clinical training by students and provide some evidence on the basis of which simulation and clinical skills centres will be able to request additional staff and resources with ultimate increased benefits to both students and patients.

METHOD: Following ethical approval, a survey using structured and semi-structured questions to illuminate qualitative and quantitative data was designed and distributed to students on all years of the pre-registration nursing programme (n=1800) via the University's online managed learning environment (StudyNet). Upon return of the questionnaires, allowing a 2-month period for the students to reply, the data will be analysed using statistical and thematic analysis. A comparison will be made between students who have benefited from simulation training versus those who have only received clinical skills training in the classroom.

Conclusion The results of this survey will provide both statistical and qualitative data from the students' perspective of their clinical training whilst at the University. This will provide an insight into the extent to which experiential learning through simulation and clinical skills training prepares them for practice. If judged beneficial by students, it could encourage the funding for superior simulation and skills training centres for experiential and hands-on training. This in turn could improve recruitment and attrition rates of nursing students (AimHigher 2004).

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CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1401 - POSTER BOARD # 80

Improving team communication at delivery among obstetric, anesthesia and neonatal team members using didactic instruction and on-site simulation-based training

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BACKGROUND: Crew Resource Management (CRM) training has been used in non-medical domains to enhance communication in situations where risk to life is high. In part based on these findings and other data in the literature, a subgroup of hospitals in the Vermont Oxford Network (VON), a national collaborative of hospitals dedicated to evidence-based quality improvement in neonatology, embarked on a project to improve communication in the delivery room.

METHODS: Six tertiary obstetric and neonatal intensive care units* are in the first year of this two-year project to improve communication among obstetric, anesthesia and neonatal team members. Each site has applied for and received authorization from its Institutional Review Board to conduct this project and enroll human subjects. Baseline performance at each site is being assessed by:

1) staff survey (3-point Likert scale) designed to evaluate knowledge of CRM behaviors, and 2) team communication scoring tool developed specifically for the delivery room. CRM skills are then introduced with a didactic presentation followed by real-time, simulation-based training conducted in the labor and delivery units of each hospital using commercially available technologies. Scenarios emphasizing CRM strategies such as SBAR (situation, background, assessment, recommendation), repeat-backs and transparent thinking have been developed and refined at each site. Self-selected leaders have received training in communication and serve as the primary debriefing and assessment teams.

Follow-up data will be obtained in the second year of the project. Staff surveys will be re-issued after didactic training is complete and again after simulation-based training is compete. The team communication scoring tool will be used to assess communication in both simulated and real deliveries. Results pre- and post-training will be compared to assess the effect of simulation-based training on performance during real deliveries.

RESULTS: The members of this collaborative have accomplished a number of important tasks as they near the end of the first year of this project. They have developed and refined two assessment tools (staff survey, team communication scoring tool), designed a number of training scenarios, standardized the content and equipment used in these scenarios across six sites, trained leaders at each site in debriefing and scoring team performance, and have begun assessing baseline content knowledge and communication in the real delivery room. Over 500 staff surveys have been returned thus far and real delivery room performance is being scored on a daily basis.

CONCLUSIONS: Implementation of simulation-based training can be accomplished using current technologies in the actual clinical environments at centers lacking dedicated simulation facilities. By first identifying focused learning objectives, then developing pertinent assessment tools and practical implementation strategies, it is possible to carry out simulation-based training in the "real world" that has the potential to improve staff performance, institutional safety culture, and ultimately patient care.

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CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1402 - POSTER BOARD # 3

Reflective Simulation: Enhancing the student' learning experiences through structure and guidance

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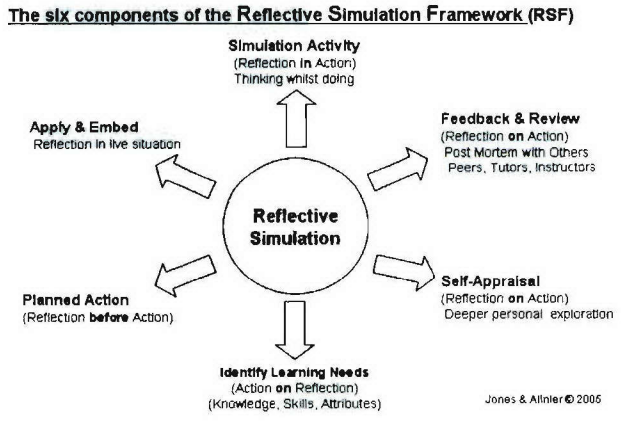
INTRODUCTION Reflective practice in nursing, medicine and allied health care disciplines is now commonly recognised in UK professional benchmark statements and seen as a desirable outcome for both clinical practice and continuing professional development (CPD). Described as process through which students can purposefully revisit, analyse, evaluate and learn from experiences, the Reflective Simulation Framework (RSF)[1] is designed to structure and guide the students' experiences in ways that foster deep learning about critical incident management. The underlying pedagogies are grounded in the works of Dewey[2] and Kolb[3].

The Reflective Simulation Framework The (RSF) which comprises six dimensions is an iterative learner centred model which can be used flexibly to explore the simulated experience in order to enhance learning and practice and crucially act as a basis for multiple feedback systems

DISCUSSION Currently, there is a lack of structured guidance in the field Simulation learning to promote reflective practice[4,5]. This is especially the case before students attend simulation activities. As the use of simulation based learning has increased considerably, a real need has been identified to provide students and instructors with a more concrete approach to engaging with reflective learning. We propose that unlike other approaches to learning the RSF can be used as an advanced organiser to help accelerate the learning process not just after the event but prior to and during simulation experiences. We believe that the RSF model should be handed out to students alongside other introductory materials as part of the overall orientation to simulation. The definitions, features and use of



RSF when combined present a creative and flexible approach to reflective simulation learning and teaching in structured and guided ways. The visual representation of reflective processes promotes reflection as a conscious formal activity with purposeful outcomes for personal development and enhanced professional practice.

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CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1404 - POSTER BOARD # 4

Efficacy of a Human Patient Simulator to Improve Senior Residents' skills in Functioning as a Team Leader During Trauma Resuscitations

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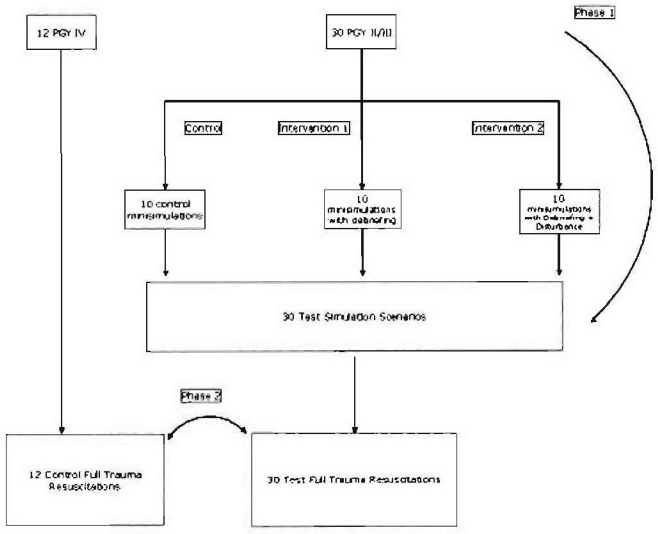
Effective communication and leadership skills are vital in leaders of trauma resuscitations. These aspects of physician behavior are seldom taught during medical education. Use of human patient simulators to create trauma situations "on demand" and without risk to patients may facilitate acquisition of these skills. To date there are no studies that examine which aspects of simulation exercises are responsible for improvement in physician performance on subsequent simulations. Additionally, though there is some evidence that procedural skills learned in a simulation environment can translate into real life procedural improvement, it has not been convincingly demonstrated that skills related to team leadership acquired during a simulation exercise can be reliably transferred to real trauma situations.

We have designed a two phase study to address these issues. In phase 1, to examine which aspects of simulation exercises are required for learning, 30 senior emergency medicine (EM) and general surgery (GS) residents will be randomized into a control and 2 intervention groups, each of which will be exposed to two simulation scenarios that are identical in terms of traumatic injuries. The members of intervention group 1 will also be exposed to a debriefing session that will focus on the crisis resource management effort of the team leader, specifically encouraging reflection on the traits required of the trauma team leader. Intervention group 2 will be exposed to the same trauma scenarios and debriefing session, but with the addition of a "disturbance" to each scenario that is designed to challenge the ability of the team leader to function in his/her required role. After participation in these 2 scenarios, each study subject will undergo a videotaped test trauma simulation. Outcome measures will be twofold. The first will be in the form of a leadership evaluation rating form, filled out by independent EM and GS faculty members who are blinded to the subject's study group. The second will be a self-efficacy instrument designed to assess levels of self confidence in leadership capabilities. It is hypothesized that it is necessary to provide a debriefing session as well as a simulation scenario that specifically targets leadership in order to see improvement in the leadership domain.

The purpose of phase 2 of this study will be to compare the 30 residents who underwent training on the trauma simulator with 12 historical controls who have not been exposed to the simulation scenarios, and evaluate (with the same assessment tools previously described) each group's performance as team leader in real full trauma resuscitations.



CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1409 - POSTER BOARD # 64

Medical Decision Making Under Stress-Evaluating the Impact of Medical Simulation Instruction on Affective Learning

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PURPOSE: In an emergency, cognitive ability, performance, and decision making skills of personnel are often impaired due to physical and psychological effects of stress. Previous research has demonstrated the potential of simulation to improve cognitive and psychomotor outcomes, while little attention focused on affective learning domains and performance. The goal of this research was to use patient simulation in combination with stress inoculation training to decrease the physiological and psychological effects of stress experienced by participants and thereby diminish its effects on decision making and skill degradation and improve overall medical performance to a simulated anesthesia emergency.

METHODS: We assessed the impact of psychological and physiological stress upon performance of senior SRNAs during a series simulated emergencies. Psychological measurements included the State-Trait Anxiety Inventory and two Likert-scale responses to the subject's perceived levels of stress and self-confidence. Physiological measures included heart rate, blood pressure, and salivary cortisol level. Performance was judged by a 3 CRNA panel using a standardized 100 point score sheet. Because of the individual variation in response to stress, each subject served as their own control. Each subject participated in a pre- and post intervention simulation scenario four weeks apart. Each subject received 12 hours of simulation-based instruction in the management of anesthesia related emergencies and in the theory and application of stress inoculation training.

FINDINGS: The average age of the subject group (N = 54) was 39.2 years, gender ratio was 60% female to 40% males, with an average of 12.6 years of nursing experience. All measures showed significant increases above resting baselines obtained before the simulation scenarios. In comparisons during the pre- and post-intervention scenarios, physiologic measures showed a significant decrease: heart rate ($p \leq 0.001$), systolic blood pressure ($p \leq 0.001$), and salivary cortisol level ($p \leq 0.001$). State anxiety scores decreased an average of 10.6 points ($p \leq 0.001$) while trait anxiety remained unchanged ($p = 0.098$). Perceived stress going into both scenarios was not significantly different ($p = 0.175$). However, their perceived level of stress during the post-intervention scenario declined significantly ($p = 0.0007$). Self-confidence was significantly higher going in to the post intervention scenario ($p \leq 0.001$). Likewise, self-confidence during the post-intervention scenario was significantly higher ($p = 0.0023$). Performance ratings significantly improved between the pre- and post-intervention measures ($p \leq 0.001$).

DISCUSSION: This study documents the stress load that patient simulation is capable of replicating through cognitive, psychomotor, and affective requirements placed on medical personnel in a simulated emergency. While subjects reported a high level of perceived stress even during our post-intervention assessment, validating the realism of the simulation, their confidence and their performance ratings were high. Our study was able to demonstrate an improvement in medical performance following simulation-based instruction in the management of anesthesia related emergencies and the application of stress inoculation training. This study affirms the utility of simulation-based instruction in mitigating the physical and psychological effects of stress, created by the emergency event itself which otherwise may impair thought process, performance, and decision making abilities of medical personnel.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1414 - POSTER BOARD # 43

An Innovative Method Of Transmitting Abnormal Auditory Findings For Medical Simulation In A Teaching Setting

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INTRODUCTION: A limitation of using standardized patients in training medical students and residents to detect sound abnormalities is the inability to demonstrate realistic abnormal findings. We describe an inexpensive, yet adequate method of broadcasting abnormal auditory findings to a conventional stethoscope with only slight modification.

METHOD: A wireless FM radio transmitter sends medically-appropriate teaching sounds to a training stethoscope (a conventional stethoscope wired with an FM receiver). Medical trainees are able to carry out normal physical exam of patients under the close observation of practicing medical personnel. Faculty may select clinically normal or abnormal sounds which are pulmonary, cardiac, abdominal, and/or vascular in nature. The pre-selected sound(s) are sent from the transmitter to the receiver in undetected fashion such that they appear to be originating from the point of contact with the stethoscope head.

RESULTS: The range of this device is approximately six to twelve feet which allows this device to be implemented in a patient-physician training setting with or without the presence of the supervising physician in the same room. Additionally, using several properly modified stethoscopes, this device may be adapted for use in small group teaching scenarios and/or when using patient simulators.

CONCLUSIONS: In an age when time and cost restrictions result in fewer opportunities to observe the basics of medicine, medical simulation comes to the forefront. This auditory medical simulation device provides the benefit of meeting the time and cost restrictions of medical training, as well as the opportunity for a controlled teaching environment with respect to clinical auditory findings.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1415 - POSTER BOARD # 100

Identification of Human Factors Elucidated during Obstetrical Team Training using High-Fidelity Simulation

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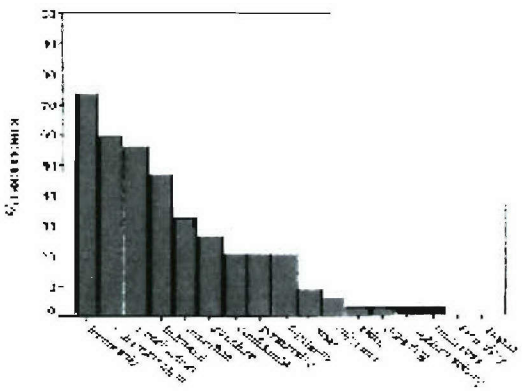
INTRODUCTION: The issue of patient safety is at the forefront of both public and medical discussions. This study involves the development of a multidisciplinary program using realistic high-fidelity simulation that promotes patient safety in parturients.

METHODS: After REB approval, 6 obstetricians, 3 obstetrics residents, 6 anesthesiologists, 3 anesthesia residents and 15 obstetric nurses were invited to participate. Teams managed 4 high-fidelity obstetrical emergency scenarios: 1) urgent Caesarean section (C/S), difficult airway; 2) urgent C/S, severe preeclampsia; 3) twin gestation, cord prolapse; 4) emergent C/S, abruption, massive blood loss. Participants were asked to complete a questionnaire regarding the realism and usefulness of the session and as well to identify important human factors that contributed to the teams' performances in either a negative or positive way.

RESULTS: Thirty-four physicians and nurses participated in the study. Their opinions of the simulation scenarios are represented in Table 1. There was no statistically significant difference in opinions between RNs and MDs except the item concerning the feeling of intimidation in the setting. Figure 1 identifies the participants' opinions of what human



factors were most important to how the teams performed during the obstetrical crises.

DISCUSSION: The use of simulation is a valuable teaching tool for obstetric teams and scenarios were felt to be realistic and relevant to clinical practice. Important human factors items were identified by participants and can be used to guide future education and evaluation of teams using high-fidelity simulation.

Scenario Opinions Mean ± SD (1=strongly disagree, 5=strongly agree)

Questions	All (n=34)	RNs (n=16)	MDs (n=18)
The scenarios were realistic	3.91± 0.97	4.00 ± 1.03	3.83 ±0.92
The scenarios represented a real situation	4.15±0.99	4.25±1.00	4.06±1.00
The scenarios were important ones to rehearse	4.62±0.89	4.88±0.34	4.39±1.14
I felt intimidated in this setting	3.00±1.41	3.63*±1.36	2.44*±1.25
I felt that practicing these scenarios will improve clinical performance	4.09±1.22	4.06±1.24	4.11±1.23
Knowing I was being evaluated affected my performance	2.82±1.53	3.19±1.72	2.50±1.29

*p=0.028

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1419 - POSTER BOARD # 92

Cochlear Implant Insertion: A Virtual Approach for Medical Education

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Cochlear implantation is a maximally invasive yet delicate surgical procedure that involves placement of a tiny electrode array deep inside the inner ear, in order to electrically excite the auditory nerve and provide the sensation of sound to the recipient. Surgeons must undertake years of specialized training to develop the skill required to perform such an operation. In this work, a surgical simulator has been produced to supplement current methods of otologist training. The surgeon is able to perform real-time cochlear implant insertion into a three-dimensional model of the human Scala Tympani (ST). Visual and force-feedback are relayed to the user throughout the insertion. The haptic representation is based on physical data. Force profiles from the simulation are compared with those produced experimentally, in order to validate the model.

The literature presents the overall project, including the visual and haptic responses of the system. Haptic modeling is the primary focus of the work and includes optimization approaches for simplification of the ST polygonal surface representation, as well as subsampling the electrode carrier to enable real-time haptic responses. Physical properties of the ST and carrier, such as the accumulation of force due to friction, are included in the model. Results for comparison of experimental and simulated data are presented. During the insertion process, force, torque and position data is logged. This information is used to compare the results produced from the simulation with data that has been experimentally determined. Insertion experiments were performed using an Instron (Instron Pty Ltd.) force measurement device to advance a Nucleus® 24 ContourTM electrode array into a synthetic model of the human ST. A statistical analysis is currently underway, to compare the results produced experimentally with those from the simulation. However, preliminary comparisons reveal significant similarities between force profiles. Final simulator characteristics are discussed in the work.

This system is the first of its kind to offer real-time visual and haptic feedback during insertion of a cochlear implant into an anatomically accurate model of the human ST. It will enable surgeons to practice the procedure pre-operatively in a safe, reproducible and cost-effective environment. It also demonstrates potential for application to other medical techniques, including laparoscopies, biopsies or alternative device implantations.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1421 - POSTER BOARD # 5

Real Patient Intensive Care Data On A Patient Simulator

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INTRODUCTION: Simulation of the course of disease of critically ill patients is a difficult but desirable task for the training of medical professionals.

The usage of existing model-driven patient simulators in this field can be questioned as their educational models are based on "healthy" patient's physiology and typical problems of intensive care patients (e.g. development of multi organ failures) cannot be simulated very well. To a big part this is due to a lack of mathematical models that describe the pathophysiological processes in critically ill patients and obtaining mathematical sound models for such patients will probably not be possible in the near future.

How can we approach simulation of intensive care patients using the available tools? The first step could be educational reproduction of a real patient's course of disease.

METHODS: Based on data from a patient data management system of about 3000 intensive care patients with 15000 total days of treatment we developed a method to automatically transfer the course of a real patient's diseases into scenarios on a METI Human Patient Simulator. The baseline data codes bedside information about the patient and his disease, a record of the status of the patient during his stay in the intensive care unit dissected into the performance of individual organ systems on a 24h basis. The performance of each of these organ systems was qualified in one of 5 discrete classes from "fully functional" to "highly critical". Additionally a tendency of the development of the status in each of the organ systems was recorded on a daily basis.

Using METI HPS version 6.3 as a physiology simulator, we identified the parameters inside the HPS software that describe function and performance of each of the recorded organ systems. We calibrated the values for each of these parameter sets to the levels of the discrete classes that described the organ status. The tendency of the developments in each of the organ systems was then translated into an onset-speed of the change of each of the parameters for the organ system. The data of each of the recorded days of a patient's stay in the ICU was coded into a state in a METI HPS scenario.

RESULTS: The translation of real ICU patient data into METI HPS patients and scenarios generates patient models which - within the limits of educational models - represent the underlying real patient. It enables us to look at the course of a disease in real time as well as in just a few minutes. This allows to discover general tendencies and correlations of different states in the disease. With this method we obtain a possibility to reproduce critically ill patients for demonstration and training purposes.

DISCLOSURE:

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Board Member/Consultant/Advisor	Medical Education Technologies Inc. Vollmer, Monk, Heinrichs

ABSTRACT # 1425 - POSTER BOARD # 32

"Clinical Concepts": A Method For The Easy Creation Of Patients On A Full Scale Simulator

Stefan Moenk,[1,2] Jochen Vollmer,[2] Michael Schütz,[1] Benjamin Kos,[1] Wolfgang Heinrichs[1,2]; [1]Simulation Center, Mainz University, Germany, [2]AQAI GmbH Simulation, Mainz, Germany

BACKGROUND: Model-driven, mannequin based simulators with models of physiology allow the creation of realistic patients for educational purposes. The resulting scenarios are potentially realistic and may require less instructor interference than scenarios without models of physiology. Realistic simulator reactions are important for the "suspense of disbelief" Disadvantage of this approach is the requirement to learn the complex models. Also, some facilitators wish to use the models in a way that is more conform with their clinical thinking: They employ mental concepts instead of physiological values to describe a state. E.g. instead of "increased intravascular volume, heart rate, respiratory rate, oxygen consumption with decreased functional residual capacity etc." one could speak of pregnancy. We describe a method that allows the implementation of clinical concepts into physiological modelling.

METHOD: We based our work on the Human Patient Simulator (HPS, METI, Sarasota) version 6.3. For selected physiological states we collected from the literature a detailed list of physiological changes. For physiologic conditions that can be further classified (e.g. acute or chronic hypertension) we described each state. In a next step we created a list of model variables and computations to generate HPS values from the collected data. The result is a matrix with literature data as input and simulator variables and computations as output.

RESULT: We have generated data sets for 2 different physiological conditions: Pregnancy and hypertensive disease. We generated a software programme which allows the easy selection of physiological states which are transferred into the HPS. E.g. in the case of pregnancy it allows the selection and combination of the trimester and of complications such as eclampsia. With very few user inputs, complex clinical cases can be generated based on the concepts used by clinicians. The system allows the combination of full scale model driven simulation with a simple user interface for complex cases and supports the mental concepts that are shared by clinicians.

DISCLOSURE:

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Board Member/Consultant/Advisor	METI Ltd., Sarasota

ABSTRACT # 1428 - POSTER BOARD # 6

Using Simulation for Nursing Competencies: Catching Problems in Training Courses

Leonard D Wade,[1,3] Rene Catalano,[2] Viva J Siddall,[1,3] Robert Gould[1,3]; [1]Northwestern University Feinberg School of Mediceine, Department of Anesthesiology, [2]Northwestern Memorial Hospital Department of Nursing, [3]Northwestern Memorial Hospital Patient Safety Simulator Center

INTRODUCTION: In the last few years, our institution has been utilizing our Simulation Center to evaluate nursing competencies. It has become an increasingly popular evaluation tool for nursing administrators in charge of training. We recently discovered how using our simulation lab for competency evaluations revealed a possible problem area for one of our nursing training courses.

MATERIALS AND METHODS: A total of 36 ICU nurses were divided into 13 groups, with most groups comprised of 3 nurses. Using the HPS-6 model Human Patient Simulator (Medical Education Technologies, Inc. Sarasota, FL), each group took part in the same case scenario. The scenario was a complex one, designed in a way that the nurses would have to demonstrate their ability to perform many important ICU tasks. The tasks included demonstrating skills in: airway management, ABG interpretation, IABP waveform analysis, femoral artery sheath removal, Propofol dosing, using various defibrillator modes during a cardiac arrest, PA catheter waveform analysis, hemodynamic data interpretatation, extubation procedures, transvenous pacing and checking blood products for administration. The ICU nurse trainer ran each scenario and utilized the instant feedback method to correct mistakes, thereby incorporating teaching into the scenario as well as evaluation.

RESULTS: A wide variety of mistakes were made throughout the course of the evaluations. However, of all the specific competency tasks that were built into the scenario, the one with the most interesting finding was the *checking blood products for administration* task. An alarming number of groups made the same potentially serious error when checking blood products: they were checking the blood requisition donor pool number against its own carbon copy rather than against the bar code/donor pool label on the blood product. Unfortunately, we did not record the exact number of groups that made this error, however, both the ICU trainer and the simulator operator estimated that 10 of the 13 groups (76%) made that mistake.

DISCUSSION: What makes this finding so interesting, is that as part of our hospital's ongoing quality control program, the entire nursing department had recently completed an educational initiative on this very task - the approved protocol for the proper checking and administration of blood products. It became more and more apparent as each of our sessions concluded, that this particular part of the checking procedure was not stressed during the hospital-wide training. As a result of our observations in the simulation lab, all of the ICU nurses in the unit utilizing this scenario have had additional training in checking blood products for administration. The ICU trainer is currently in the process of collaborating with the hospital to ensure that future hospital-wide training on checking blood products stresses the importance of checking the blood requisition against the blood product label and not the carbon copy. We feel that this exemplifies how using simulation as part of the nursing competency testing process can not only be extremely beneficial for evaluating nursing skills, it can also be used to help identify specific problem areas in training courses.

DISCLOSURE:

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Board Member/Consultant/Advisor	Medical Education Technologies, Inc.

ABSTRACT # 1429 - POSTER BOARD # 76

The Magnetic Resonance Imaging Story: Assessing time to clinical competency and the future implementation of simulation

Lorraine Ramsay, Michelle Mummery, Kathryn Parker, Karim S Bandali

The Michener Institute for Applied Health Sciences The present clinical education model for allied health programs is fully dependent on the number of available clinical placements. A decrease in the number of available placements and the high cost of clinical education are presenting significant challenges to educational programs. Decreased available clinical spaces leads to a decreased number of applicants accepted into a program. The implications for future human resources and the effect on patient wait-times for diagnostic tests such as Magnetic Resonance Imaging (MRI) are immense. In response to these issues, The Michener Institute for Applied Health Sciences conducted a retrospective analysis in our MRI program to determine at which point during the students' 12 week clinical rotation they were assessed as competent. It was found that a majority of students, 55%, reach competency by week 11, while a further 36% demonstrated competency by week 12, and 9% required more than the 12 weeks.

These findings led to further inquiry into possible ways in which to deliver clinical education to each of these three groups of students to enhance their learning experience and assess the time to reach competency. The introduction of simulation activities into the curriculum prior to the clinical rotation is proposed to aid in reducing the length of the rotation, in improving the efficiency of time spent in the clinical site and provide remediation to those students in need of additional clinical experience. To investigate the impact of a simulated-enhanced curriculum on clinical education, a current funded project will allow for the introduction of two levels of simulation in the program's didactic phase.

The first is the implementation of unique, individual software-based simulators for protocol manipulation. The second is the installation of an MRI sham unit, an exact replica of a fully functional MR system without the need for a full and expensive magnet set-up. The first student cohort to experience the simulation-enhanced curriculum (SEC) will complete the program in the fall of 2006. Time to clinical competency for the SEC cohort will be calculated and compared to the previous cohort. In addition, semi-structured interviews with SEC students and their clinical educators will investigate the value of the SEC curriculum and its impact on the quality of the clinical experience. It is anticipated that the implementation of the SEC will better prepare students, lead to the reduction in clinical time thereby potentially contributing to decreased wait times, timely access to diagnostic tests and reduced workload of technologists and clinicians, ultimately benefiting patient care.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1432 - POSTER BOARD # 86

A Comparative Study Of Coordination Processes Related To Different Levels Of Performance During A Simulated Anesthetic Crisis

Tanja Manser, T. Kyle Harrison, Steven K. Howard, David M. Gaba; VA Palo Alto Health Care System

BACKGROUND AND GOAL: Incident analyses show that many critical situations in health care correspond to difficulties in teamwork or more specifically in communication and coordination. In anesthesia, one of the most complex and dynamic work settings within the hospital, the structure and process of crew coordination related to high performance during crisis situations have not yet been investigated. In other domains high performing crews have been described to adapt their coordination processes to the situational requirements. A pilot study was conducted to describe coordination processes related to different levels of performance during a simulated anesthetic crisis.

MATERIALS AND METHODS: The coordination process of 24 anesthesia crews during simulated MH scenarios (ACRM1 courses) was recorded using a predefined set of observation categories (Manser et al., 2005). The relative frequencies of the various coordination activities were correlated with technical performance scores for the treatment of MH (Harrison et al., 2004). The quantitative analysis was complemented by a qualitative analysis of the coordination processes.

RESULTS: During the actual crisis, several differences can be noted in the coordination processes of high and low performing crews. For example, anesthesia crews with higher MH-treatment scores less time on "task management" (Spearman $r=-.46$, $p<.05$). Specifically they spent less time on "task distribution" (Spearman $r=-.44$, $p<.05$) especially with team members outside the anesthesia crew (Spearman $r=-.60$, $p<.01$). Also, a higher proportion of the coordination activities of higher scoring crews was categorized as "coordination via work environment" (Spearman $r=.55$, $p<.01$). These results were complemented by qualitative analyses showing that lower scoring crews activate more resources than they can coordinate effectively, are more likely to split into sub-crews, and increase workload based on wrong assumptions.

DISCUSSION: In this pilot study, we found differences in the coordination processes of anesthesia crews that are related to the technical performance during simulated crisis situations. Based on these results, a more comprehensive study looking at different types of crisis situations and including participants with different levels of experience will contribute to a better understanding of the coordination-performance relationship and finally to the development of specific coordination training to further improve performance.

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CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1444 - POSTER BOARD # 7

Becoming A Simulator Instructor And Learning To Facilitate: *Evaluation Of The Instructor And Facilitation Training – Infact*

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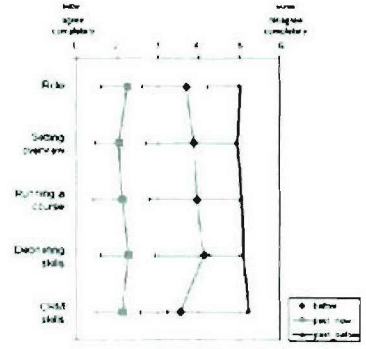
BACKGROUND: Simulation-based training courses using video-debriefing techniques require very competent instructors, especially when focussing on human factors and crisis resource management (CRM). We developed an instructor course to help new users of simulation to use the tool of realistic simulation to its full potential. The Instructor and Facilitation Training (InFacT) was provided for approximately 170 future simulator instructors in Germany, Italy, and the Netherlands. InFacT focuses on realistic CRM simulator training with video-debriefing.

METHOD: The InFacT course runs four days and is divided into two blocks (two days each). Participants gradually switch from the role of a course participant in a simulator course (experience phase) into the role of a simulator instructor (InFacT "double feature" concept to allow for different perspectives of the trainees). Performing simulations and debriefings is the main focus of the course. Intermittent theory modules (patient safety, CRM, briefing and debriefing, the simulator setting, and scenario design) are supplemented by workshops, practice parts and extensive feedback. Participants begin to do debriefings and later scenarios and debriefings and receive feedback from themselves, other participants as well as from the interdisciplinary InFacT course directors. We report the detailed questionnaire based evaluation of three InFacT courses which were conducted at "SimuLearn" in Bologna, Italy with $N=70$ participants. Questionnaires contained 30 items on subjective competency ratings within five scales (clarity of instructor role, simulator setting overview, running a simulator course, debriefing skills, CRM skills). The questionnaire was filled in prior to (pre) and after the course (post now, post before), including methods to assess "response shift bias" (Howard et al., 1979).

RESULTS: As a multivariate analysis of variance did not yield statistical significant effects between the 3 different courses the results were combined in figure 1. The repeated



measures factor time (before, post now, post before) did yield statistical significance ($F(10, 29)=39,17$, $p<.001$ Wilks Lambda): for all five scales subjective competency ratings after the course were higher than prior to the course. After the course the estimation of competencies prior to the course was lower than the same estimation before the course, indicating a strong response shift.

CONCLUSION: The results suggest that InFacT participants gained new insights into the task of being a simulator instructor for advanced simulation based courses. There was a strong response shift between pre and post before ratings. Especially when comparing the "post now" rating with the "post before" rating there seemed to be a remarkable learning curve during the 2 x 2 days course. As several of the trained instructors successfully performed simulation courses after the InFacT these questionnaire-based findings are at least anecdotally supported in practice.

DISCLOSURE:

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Board Member/Consultant/Advisor	SimuLearn, Bologna Italy - Dieckmann, Rall
Lecturer/Speaker	Laerdal International, Stavanger Norway, Laerdal Medical, Puchheim Germany - Dieckmann, Rall

ABSTRACT # 1448 - POSTER BOARD # 87

Development of High Fidelity Simulations for Exploring Surgical Stress

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BACKGROUND: Excessive stress can impair surgical performance, but its impact on surgical competence is under-researched. Mapping intraoperative stress and defining coping strategies requires a systematic approach. We have developed a multidimensional stress measurement profile, combining individual stress indicators with coping skill assessment.

High fidelity simulations provide a standardized environment where stressors can be applied without jeopardizing patient safety. Surgical procedures must be sufficiently complex to generate stress levels in surgeons of varying experience. This study evaluates an innovative simulation design using carotid endarterectomy (CEA) under local anaesthesia.

METHODS: CEA is a technically challenging procedure with potential intraoperative stressors (e.g. bradycardia, stroke, time pressure, managing a conscious patient while operating). Simulated CEA provides a framework for structured stress assessment, using physiological parameters (salivary cortisol, heart rate, heart rate variability), stress questionnaires, interviews and observations. Simulations used a full surgical team in our high fidelity simulated operating theatre. Trained actors portrayed patients. Each participant underwent two levels of challenge: non-crisis (routine CEA) and crisis scenarios.

Perceived difficulty and stress were compared between the scenarios. Realism was evaluated by interviews and rating scales, the latter compared between surgeons with different levels of CEA experience.

RESULTS: 56 full-scale simulations were carried out with surgeons of varying experience (range 2 – 34 years). Interview results showed that the CEA simulation challenged surgeons at all levels of experience. Non-crisis and crisis scenarios were perceived as significantly different in their levels of difficulty and stress (all $p<0.001$ Wilcoxon Signed Ranks Test). The realism of the simulation, in particular the crisis scenario, was rated as very high ($M=8.5$, $SD=0.86$; using a 0–10 scale). Experienced surgeons rated the realism significantly higher than surgeons with no previous exposure to a CEA ($p<0.006$ T-Test).

CONCLUSION: The experimental design using CEA simulation offers a feasible framework for applying a complex stress measurement set. The procedure enabled assessment of surgeons across a range of experience. This simulation provides a sophisticated research tool for exploring intraoperative stress and coping strategies, and offers a safe educational environment for surgical stress management training.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1449 - POSTER BOARD # 39

Interventional Vascular Simulation Is Mostly Beneficial For Training Of Fellows And Teaching The Use Of New Devices And Procedures

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INTRODUCTION: Interventional Vascular Simulation (IVS) is an emerging technology in medical education, although its full role has not been established yet. We report the evaluation of IVS in various training categories done by a large group of interventional cardiologists.

METHODS: During TCT 2004, interventional cardiologists could participate in hands-on introductory sessions on 23 simulators made by 6 different manufacturers (CATHI, Immersion Medical, Medical Simulation Corporation, Mentice, Simbionix, Xitact) that simulated coronary, carotid, and renal interventions. At the end of the session, participants evaluated the simulators and educational sessions, and graded IVS as a training instrument.

RESULTS: A total of 379 interventional cardiologists filled the evaluation form, of whom 75% were attending physicians, with mean experience of 8 years of interventional practice, and mean of 200 interventions per year. The Table summarizes the evaluation of IVS. Values are given on a scale of 1–5 (5=best, 1=worst). The sessions fulfilled the expectations in 91.2%, and obtained a score of 4.23. A total of 92.2% of the fellows and 95.3% of the attending physicians believed that simulator training should be implemented prior to training on patients.

CONCLUSIONS: As evaluated by large cohort of interventional cardiologists, IVS may provide the largest benefit for fellows training in interventional cardiology and for guiding the use of new devices and procedures. Further studies are needed to validate the benefit of IVS for training and credentialing.

	Grading (range)
TCT simulation session rating	4.23(4,5)
Resemblance of simulation to actual cases	3.69(3,4)
Current technology status	3.77(3,4)
Benefit for fellows in cardiology	4.35(4,5)
Benefit for fellows in interventional cardiology	4.46(4,5)
Benefit to experienced interventionalists	3.83(3,5)
Benefit for training for new device/procedure	4.44(4,5)
Benefit to patients	3.82(3,5)
Objectivity in credentialing process	3.73(3,4)

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1451 - POSTER BOARD # 33

A Computer-Based Simulation Of Diabetes Mellitus: A Tool For Teaching And Assessing Competence In Patient Care

Steve Lieberman; University of Texas Medical Branch, Galveston TX

The prevalence of diabetes is growing rapidly worldwide as a result of changing lifestyles. Fortunately, much has been learned and many new tools have been developed to improve management of affected patients. The increasing sophistication of diabetes management requires frequent updating of knowledge and skills to assure practitioners' competence.

A computer-based simulation of type 2 diabetes has been developed as a tool for practice and assessment of management of diabetic patients. At the core of the program is a series of equations that iteratively calculate serum levels of glucose, insulin, and counterregulatory hormones along with changes in underlying physiologic parameters (eg, insulin secretion, insulin sensitivity, hepatic glucose production). The basic equations include: insulin = glucose^m [where m represents insulin secretion by the pancreas], and glucose = (k/insulin) + HGP [where k represents insulin sensitivity and HGP represents hepatic glucose production]. Each of these parameters can be altered by drugs, counterregulatory hormones, and the natural history of the disease. The complete mathematical model, which is derived from clinical studies of normal and diabetic individuals, realistically and faithfully simulates the clinical course of the disease, including biologic effects of hormones, drugs, caloric intake, and exercise; drug pharmacokinetics; glucose toxicity; and the chronic deterioration characteristic of type 2 diabetes.

The underlying physiologic parameters can be varied to produce a virtually endless supply of simulated patients with varying severity of diabetes. The calculations produce a full set of data for each 15 minutes during the day of a patient, and weeks worth of data are calculated in seconds. This time compression allows students to manage multiple patients over the course of months or years in a single sitting. Glucose levels are displayed on-screen in a replica of a log book typical of those used by diabetic patients. To enhance the realism of the program, the consistency of glucose readings and patients' adherence to recommended glucose monitoring can be varied. This allows a wide range of difficulty for learners at different stages of training.

Patients are managed with diet, exercise, and pharmacologic agents from all major classes of oral anti-diabetic drugs and insulins. Patients' adherence to therapy can be varied to increase the challenge for more advanced learners. Patients can be designed to have contraindications to specific drugs in order to assess the learner's ability to select drugs properly. Appropriate laboratory tests can be ordered and a history of results is displayed. Finally, learner's adherence to guidelines for diabetes management can be tracked.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1454 - POSTER BOARD # 8

After the Fact: Using Performance Data from a Standardized Patient Examination to Inform the Curriculum

Karen Szauter, Michael Ainsworth; The University of Texas Medical Branch

INTRODUCTION: Standardized patients (SPs) are used in 96% of US medical school for teaching or assessment. The application of SP-based examinations to assess student skills has been studied extensively and is widely accepted. We have performed detailed reviews of outcome data from SP based examinations. We describe how this information can inform the educational curriculum

METHODS: Our institution requires all medical students to successfully complete a SP-based clinical skills assessment early in the fourth year. This multi-station examination includes content from all third-year clerkship disciplines. Students are scored by the SPs on the medical interview, physical examination, counseling and interpersonal skills. A post-encounter note, scored by faculty, allows an assessment of written communication and integration of knowledge. We have used a variety of approaches to ascertain general strengths and weaknesses of the entire student group including 1) checklist item analysis 2) comparison of overall performance across cases 3) review of SP comments 4) detailed review of written documentation and 5) video-review of specific scenarios.

RESULTS: Our medical school class size is 200 students. Through careful analysis of the overall group performance we have noted deficits in specific content areas, patient age groups, and types of presenting complaints. (eg: extremes of age, constitutional or behavioral complaints) The SP comments have revealed global issues relating to patient comfort. Review of written documentation has revealed deficiencies in student identification of pertinent positive and negative information, and in the connection between data collection and diagnostic reasoning. Video-review of specific cases (eg: breaking bad news) has allowed us to pinpoint areas of general strength and weakness in complex communication issues.

DISCUSSION: Information gained from detailed examination analysis has been provided to course directors and the curriculum committee. While deficits in individual students can be addressed with feedback and remediation for the learner, class level deficiencies suggest a mismatch between curricular objectives and student achievement. This latter finding provides the basis for discussion among educational leaders and informed curricular modification.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1455 - POSTER BOARD # 51

Use of a Medical Simulator to Diagnose Amusia in an Anesthesiology Resident: SimMan Tunes in to Tone-Deafness

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This is a case report of a 25 year old anesthesiology resident who was felt to be inattentive in the operating room by several faculty on our Clinical Competence Committee. The Faculty member who did routine simulated cases with the residents in the anesthesiology simulator (SimMan - Laerdal Medical) did not agree with this assessment. However, he did notice that in this resident's previous simulation, visual cues were used to recognize the problem being simulated. It was considered that the resident had a hearing problem, so a simple simulation was created to evaluate the resident's ability to respond to monitor alarms and tone changes.

The resident was asked to sit in the simulator room (a mock OR) with their back to the monitors and instructed to imagine that they were putting a central line into the patient. The resident was instructed to comment on the patient's condition while they were putting in the line. The resident was instructed not to turn around to look at the monitors.

The resident recognized changes in heart rate and also noticed changes in the breathing rate of the mannequin system. However, when the oxygen saturation was changed (and the tone changed on the pulse oximeter), the resident did not notice any changes until the saturation had changed by 13 percent (100 to 87). The resident described the tone as "flattening". By comparison, the vast majority of anesthesiologists notice a tone change when the saturation changes by 1 or 2 percent at most. The pulse oximeter tones were changed several times during the session without any response by the resident.

During the debriefing session, the resident was shocked that this occurred. When the pitch of the tone changing from high to low was discussed, the resident did not seem to have a real concept of these changes (analogous to describing differences between red, orange, yellow, green, blue to a color blind person). The resident decided to go to an audiologist for formal hearing testing. This testing confirmed amusia (tone-deafness).

The resident was subsequently given simulation sessions to work on compensating strategies such as increased scanning of the monitors, decreasing extraneous noise and working to try to recognize more subtle tone changes. The resident Clinical Competence Committee was also informed of these findings and re-framed its evaluation of this resident in this regard. We present this case as an example of using a medical simulator (SimMan) to diagnose a hearing difficulty and provide opportunity for the resident to work on corrective strategies.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1460 - POSTER BOARD # 102

The Development of a Role-Playing Simulation to Investigate Coordination of an OR Master Schedule

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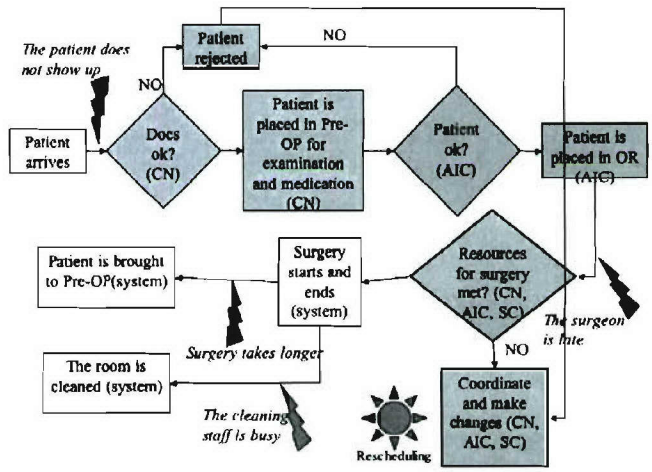
The structure of many hospitals is team-based. Safety, efficiency, and performance depend on the ability of the organizations to support coordination and collaboration across teams, tasks, and resources. To develop adequate technologies to support these processes we need a deeper understanding of how different professionals manage multiple tasks and interruptions. The goal of this research is to simulate the coordination mechanisms and trajectories of hospital personnel as they move patients in and out of OR.

In the complex hospital environment, there are at least three key types of trajectories: (a) *patient trajectories* , (b) *resource trajectories*, (c) *staff trajectories*.

We developed a web-based role-playing game to simulate a master schedule in an OR. We ask three players to take on the role of charge nurse (CN), anesthesiologist in charge (AIC), and surgeon coordinator (SC) with the goal of attending to OR scheduling dynamics, as they manage their individual trajectories and objectives in the face of interruptions. The tasks that each player is responsible for performing can be classified into three types: (1) Facilitating patient flow through the OR, (2) Coordinating the master schedule, and (3) Managing resources.

Figure 1 depicts the flow of a patient through the system, and denotes the role of each player in this flow. Throughout the patient flow, various types of interruptions can occur (shown as lightning bolts). For example, a patient may fail to arrive at the appointed time, a surgeon could be late arriving for surgery, a surgery could take longer than expected, or the cleaning staff could be too busy to clean the operating room in time for the next surgery. These types of interruptions affect trajectories by requiring players to quickly converge on a problem that requires an immediate response.



We expect that trajectories will be influenced in part by the type and frequency of interruptions encountered by the players. By superimposing the interruptions on the reconstructed trajectories, we will be able to discern how different types of interruptions affect trajectories and, ultimately, performance. Moreover, by manipulating the perceived importance of competing objectives, we can also observe how these perceptions moderate the effect of interruptions on trajectories.

The design of the game was guided by the following considerations:

COLLABORATIVE COMPLEXITY: Collaborations should be sufficiently complex to reasonably represent a real OR unit, but simple enough to ensure that the game is playable.

GAME TIME: The game should represent a full 8-hour shift of OR unit surgeries. Game time is, therefore, accelerated over real time by a factor of 8. This allows an 8-hour shift to be "played" in one hour of real time.

EASE OF USE: We chose to use a Web-based interface to leverage players' prior experience with Web technologies. This novel method of studying trajectories and interruptions will yield new insights into the processes that underlie collaborative work in critical environments.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1461 - POSTER BOARD # 30

Evaluation of an electronic system to enhance crisis resource management training

Mohamed I Foraida, Michael A DeVita, John J Schaefer; University of Pittsburgh School of Medicine

OBJECTIVE: To examine an electronic platform that engages medical crisis resource management (CRM) trainees in the performance critiquing process, and to assess the acceptability and credibility of the "individualized" feedback generated by the platform. The training is focused on organizational aspects of crisis management, and reinforces teamwork.

DESIGN: An electronic critiquing and feedback platform was developed to (a) engage trainees in the critiquing process and (b) individualize feedback to trainees. This study –the second of two– focused on examining the credibility of the approach for generating individualized trainee feedback. All trainees used the system after every simulated crisis throughout the course, and their critiques were compared to that of an expert rater.

SUBJECTS: Thirty-two physicians, nurses, and respiratory therapists participated in the study as part of their hospital mandated CRM training.

PROCEDURE: CRM trainees experienced rounds of simulated crises on computerized mannequins followed by debriefing sessions that involved performance critiquing and feedback. Before starting the debriefing session, trainees critiqued their own performance and that of their co-trainees. All trainees instantly received individualized feedback based on their peers' critiques. A survey was administered to trainees to determine the acceptability of the approach.

RESULTS: Electronic critiquing was always completed in less than 3 minutes, and did not interfere with regular training procedures. The system was unanimously perceived as intuitive and easy to use. All but one subject agreed that the critiques were accurate, motivational, improved their self-awareness, and enhanced their focus. Trainees extensively over-estimated their own and their peers' performance in the first simulated crisis, as well as that of their peers. During the second simulated crisis, trainees under-estimated their own performance. After the second crisis, trainees' perceptions became closer to the expert rater's assessments. Conclusion: The electronic critiquing approach was acceptable and useful to trainees. The approach was credible for individualizing the feedback to trainees only after trainees became conscious about their own incompetence. Full scale simulation focused on organizational aspects of team performance during crisis is correlated with an improved ability to self assess performance. Discordance between perceived performance and actual performance decreases with training.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1462 - POSTER BOARD # 65

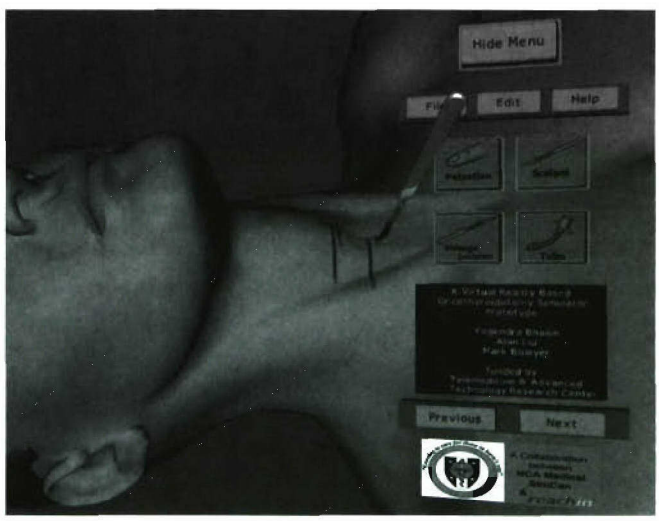
A Cricothyroidotomy Simulator with Haptic and 3D Visual Feedback

Alan Liu, Yogendra Bhasin, Eric Acosta, Gilbert Muniz, Mark Bowyer; National Capital Area Medical Simulation Center

AIMS: Open cricothyroidotomy is an essential skill in emergency airway management. It is the procedure of choice when ventilation cannot be achieved by less invasive methods. This skill has relevance to both military and civilian medical services. For example, cricothyroidotomy is the recommended approach for the management of certain thermal or toxic gas injuries during tactical field care. As another example, cricothyroidotomy may be necessary to secure the airway in gunshot wounds to the face, a situation that can be encountered both during combat and in the civilian emergency room . Current training models are inadequate from a physiological and anatomical perspective. We have developed a VR-based simulator that addresses these shortcomings. To date, no comparable computer-based simulator for cricothyroidotomy has been developed.

METHODS: Our system is based on the Haptic Workbench. Using this paradigm, users can feel virtual objects in the same location as their visual sense reports. Hand-eye coordination is preserved. Our simulator teaches students the dexterous skills necessary for cricothyroidotomy. Students can palpate a virtual neck to locate the cricothyroid membrane. The thyroid model encodes the properties of various tissue types. The system uses a novel combination of texture-mapped visuals and haptic feedback to simulate cutting. This approach creates the appearance of incisions on the skin surface, but does not change the model's topology. Surgical effects, such as bleeding are generated. The system can also simulate endotracheal tube insertion.

RESULTS: Fig. 1 is a screenshot of the simulator in use. Preliminary assessment by surgeons familiar with the procedure has been favorable. The evaluators commented favorably on the accuracy of tactile response during palpation, incision, and intubation, as well as the visual effects of bleeding.



CONCLUSIONS: A prototype cricothyroidotomy simulator has been developed. Initial evaluation by subject matter experts is favorable. Our next focus is to incorporate self- and cognitive-training capabilities in the simulator.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1464 - POSTER BOARD # 58

Classroom instruction did not improve management of septic shock in a simulated setting

David Soran, Einar Ottestad, Geoffrey Lighthall; Stanford University School of Medicine, Department of Anesthesia

BACKGROUND: Human patient simulation has provided a valuable tool in health care education with capabilities ranging from learning procedures, to improving disease management, and assimilation of more complex behaviors applicable to crisis management. Since 2001, the VA anesthesia/ ICU group has conducted monthly simulator session covering the management of respiratory failure and septic shock, as well as crisis management principles applicable to any emergent situation. Considerable variability in resident performance has been noted by the faculty during this time. Recently, a scoring system has been developed and validated for the analysis of the patient with septic shock. In attempting to understand sources of variability in performance, tapes of house staff managing the septic "patient" were reviewed, scored, and analyzed with respect to whether the simulation either came before or after a monthly lecture on the management of sepsis and shock.

METHODS: The chronologic order of monthly simulation sessions and a lecture on the management of septic shock was prospectively scrambled. The rating system for management of septic shock consists of both technical (medical) and non-technical (behavioral) items; team performances were reviewed independently by two trained observers. All technical items were consistently covered in the lecture. Simulation sessions were conducted in a recreated ICU environment with a high-fidelity computer controlled mannequin "patient." The patient's deterioration followed a standard design with patient complaints and responses to therapy also standardized. Interns are introduced to the patient and manage it for the first ten minutes, even if help is called for earlier. Following ten minutes, back up residents, fellows and consultants are allowed to participate in patient management. Technical scores were made for the first ten minutes (interns), and the subsequent 20–25 minutes of the scenario. Non-technical scores were calculated for the whole group only. All participants completed a post course survey; comparison between the groups receiving the lecture before vs. after the simulation was made by t-test.

RESULTS: Results from 22 consecutive simulations of septic shock were analyzed. Over 95% of participants found the scenarios realistic, lifelike, acknowledged that they elicited lifelike behaviors. No difference in technical or non technical performance between the "before" and "after" groups were identifiable. Analysis of individual items comprising the total score were analyzed, and again failed to reveal a difference between the "before" and "after" groups.

CONCLUSION: It is desirable to have objective and robust means to understand which forms of education lead to improved care of critically ill patients. With the availability of high-fidelity human patient simulators in a recreated clinical environment, it is possible to analyze decision-making and management of "patients" in fast-paced and high-risk situations. A scoring system evaluating technical and behavioral aspects of managing septic shock was developed and used to analyze the performance of house staff in managing a simulated patient with sepsis either with the "benefit" of a lecture on shock management before the simulation, or not. We found that the ability of classroom instruction to improve clinical performance was at least for this case, non-existent.

Average Score	Technical score		Behavioral score	
	Intern	Whole Team	Whole	team
Simulation before lecture	6.90	9.00	27.20	
(SD)	(2.46)	(1.35)	(5.87)	
Lecture before simulation	6.63	8.13	23.75	
(SD)	(1.90)	(2.18)	(6.30)	
p value of before vs. after	0.770	0.283	0.202	

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1470 - POSTER BOARD # 81

Peri-operative Simulation Training Prior to Opening a New Hospital: Can it Improve Quality and Patient Safety? A Pilot Study

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INTRODUCTION: The report from the National Academy of Sciences' Institute of Medicine cited studies showing between 44,000 and 98,000 people die each year because of mistakes by medical professionals. Our hospital system and many others in the United States have taken a proactive stance to improve quality and eliminate many of these errors. The Leapfrog Group has created a new initiative based on the National Quality Forum's (NQF) Safe Practices for Better Healthcare: A Consensus Report. The Consensus Report endorsed 30 practices that should be universally used in applicable clinical care settings to reduce the risk of harm to patients.

METHODS: Our multidisciplinary study group has developed three peri-operative scenarios: one preoperative, one operative, and one postoperative. Each scenario will include the concepts of safety using ten National Quality Forum Safety Practices which are directly applicable to peri-operative nurses (e.g., verbal orders should be recorded whenever possible and immediately read back, use standardized abbreviations and dose designations, implement standardized protocols to prevent wrong-site or wrong patient procedures). All newly hired peri-operative nurses will be recruited to undergo the simulation training and testing during the period from hospital facility opening until the time of actual patient care. Participation will be voluntary and in addition to their existing preclinical training. Before beginning any training, all participants will complete a questionnaire assessing NQF Safe Practices knowledge. The simulator scenarios will be run with peri-operative nurses participating in their own work environment. Participants will again complete the questionnaire assessing NQF Safe Practices knowledge in the 2–7 days immediately after the simulation training. Further, the hospital system routinely administers Safety Culture Climate tool to all clinical employees for quality assurance measures. We will administer the tool in the week before simulation training, during the 2–7 days immediately following simulation training, and again at two, eight, and fourteen months after beginning patient care.

RESULTS: We have developed standard peri-operative human simulation scenarios that can be utilized to train and test peri-operative healthcare nurses with regard to adherence to National Quality Forum Safe Practices. We have gathered preliminary evidence to determine if our peri-operative nurse human simulation training improves implementation of and adherence to the NQF Safe Practices. We have performed a short-term assessment of adherence to NQF Safe Practices by comparing the NQF Safe Practices knowledge of newly hired perioperative nurses both pre- and post-simulator training. This short-term data will be presented at the meeting. In the long term, we will track average peri-operative nurse safety culture scores as progress over the following time points: pre-simulation training, immediately post-simulation training, and 2, 8, and 14 months after beginning patient care.

CONCLUSION: Together, the short-term and long-term assessments will serve as pilot data to support the development of hospital-wide simulator training protocols.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1473 - POSTER BOARD # 98

Simulation: What does it really cost?

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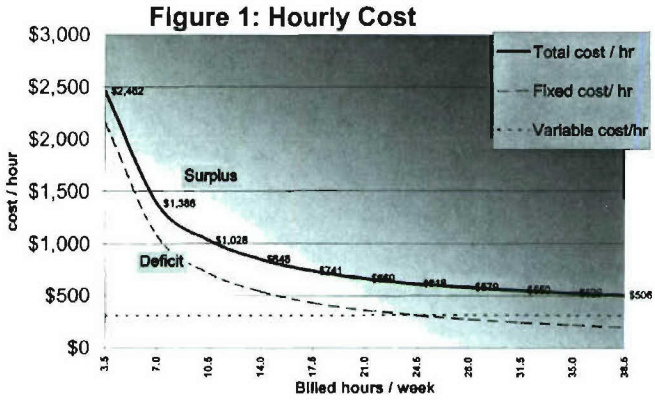
INTRODUCTION: Simulation based training is increasingly recognised as a part of health care education and as a means to improve patient safety. The number of centres worldwide has increased exponentially since 1994. However, little is known about the economics of simulation centres. The objective of this study was to determine how much it costs per hour to run a simulation centre. These data make it possible to calculate how much to it is required to charge per course in order to cover costs.

METHODS: We calculated the hourly cost for our model simulation centre applying a 'bottom-up' or micro-costing technique. Fixed (overhead) and variable costs were estimated by using market rates for different items. Using the total (fixed plus variable) cost per hour we used computer spreadsheet modelling to calculate how many hours a centre needs to bill to cover costs.

RESULTS: Set up cost was US$876,485(renovation of existing facility, equipment). Fixed costs per year totalled $361,425. Variable costs totalled $311 per course hour. The economic benefits of increasing the number of billable teaching hours per week are significant until about 21 hours (equivalent of 3 full or 6 ½ day courses) per week (averaged over 52 weeks/year) when they start to taper off. Figure 1



CONCLUSIONS: Due to the high fixed (overhead) cost structure of simulation centres, economic viability is directly tied with the number of billable hours taught per week. Any lull in business can significantly affect the bottom line. Understanding the cost structure should be used to guide rational growth in numbers of simulation centres. Minimising costs may necessitate co-operation and sharing of resources between centres. Our results suggest that economic viability of simulation centres may depend on subsidies from institutions or other external sources. This is in line with the experience of the Bristol Medical Simulation Centre who reported that in excess of 50% of their running costs needed to come from commercial sources. How a centre maintains financial viability may depend on a country or an institution's philosophy about whether centres should be government or health system funded or whether charging participants is preferable or some combination. These are complicated political issues with pros and cons for each funding model. In theory, simulation offers great potential to reduce health care costs by improving patient safety and also by reducing staffing costs via decreased training time and reduced turnover of staff. Sufficient numbers of course participants to justify simulation centre costs may be achieved if the benefits of such training are fully recognised through careful validation studies.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1474 - POSTER BOARD # 93

The Value of Using the TraumaMan® Simulator to Teach Chest Drain Insertion During the ATLS Course

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BACKGROUND: The Trauma-Man® simulator (Simulab, USA) was announced by the American College of Surgeons as a legitimate alternative to the ATLS animal surgical skill station. The aim of this study was to assess the value of using the simulator to teach chest drain insertion during the ATLS course by acquiring experts' and trainees opinions.

METHODS: Following chest drain insertion to the TraumaMan simulator, 24 experienced ATLS instructors (5 cardio-thoracic surgeons, 14 general surgeons experienced in trauma management and 6 anesthesiologists) completed a subjective questionnaire. Questionnaires were also used for assessment by 42 novice participants of the ATLS course trained with both animal skills laboratory and the simulator.

RESULTS: Median scores on a scale of 1 to 6 (1 indicates "not similar at all" and 6 indicates "identical") given by the experienced physicians to the various steps required for chest drain insertion were: anatomical landmarks - 5, tactility of the skin -4, skin incision-4, dissection of tissues-4, identification of the pleural space-5, tube insertion to the pleural space-5, and chest drain fixation -5. Trainees of the ATLS course asked to comment on the ability of the model to teach these steps of the procedure, gave median scores of: anatomical landmarks - 5, tactility of the skin -5, skin incision-5, dissection of tissues-4, identification of the pleural space-5, tube insertion to the pleural space-5, and chest drain fixation -5. The trainees found the TraumaMan superior to the animal model in representing the anatomical landmarks, and inferior in the dissection of tissues.

Experts recommended the simulator to be used to train novice physicians in chest drain insertion (5.5±0.8, in a scale of 1–6, 1 indicates "not able at all" and 6 indicates "very useful"). However, changes aiming to improve the representation of the "safe triangle" of chest drain insertion were recommended. In the current version of the simulator, part of the area designated for chest tube insertion is outside the triangle. **Conclusion:**

The Trauma-Man simulator was recommended as a training tool for chest drain insertion by both ATLS experienced instructors and novice trainees. Further improvements in the model were recommended.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1475 - POSTER BOARD # 95

Simulation Based Training for Focused Abdominal Sonography for Trauma (FAST) Performance

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BACKGROUND: The use of focused abdominal sonography for trauma (FAST) allows for rapid bed side diagnosis of intra-abdominal, pleural, or pericardial hemorrhage in trauma casualties.

PURPOSE: To develop and validate a training program for FAST performance for non radiologists using the UltraSim simulator.

METHODS: The training and evaluation program included – 1. Introductory computer based lecture for self learning of the general principles of ultrasound and FAST. 2. Introduction and hands on session on the simulator. 3. Pre training simulator based evaluation consisting of two scenarios. 4. Six training scenarios. 5. Post training evaluation consisting of two scenarios.

RESULTS: 20 physicians (3 radiologists, 5 surgeons experienced in FAST performance, 5 surgeons with moderate experience in Fast performance and 7 novices) participated in the study. During the pre training evaluation, only 14 (70%) participants correctly placed the transducer in all the examination positions, and only 5 (25%) were able to maintain the correct direction of the transducer. During the post training evaluation both parameters were correctly maintained by all participants ($p<0.001$). The time required for obtaining the image in each of the examination positions was 133 ± 87 seconds prior and 86± 58 seconds following training ($p<0/001$). The quality of the images obtained, subjectively assessed by a radiology specialist, was 7.2±2.1 prior and 8.4 ± 1.2 following training (scale of 1–10) ($p<0.001$). Correct diagnosis (positive / negative) was made in 69% and 89% for pre and post evaluations respectively ($p<0.001$). Construct validity was demonstrated in all the evaluation parameters. Never the less, radiology specialists were still better then other participants in the time required to obtain the images, quality of the images and the incidence of correct diagnosis.

Following training participants indicated that the opening presentation taught the principles of FAST, the clinical scenarios represented real clinical situations; and that the simulator system presented a real imaging situation (scores of 5.6±0.4, 5.6±0.8, 4.9±1.0, respectively in a range of 1–6). Participants recommended to use this training modality for all trauma physicians (score of 5.9±0.2). Criticism included low-quality imaging and lack of cardiac or respiratory motion. **Conclusion:**

Although data are preliminary, this study clearly demonstrates the value of simulation based training for FAST performance. Furthermore, face, content and construct validity were achieved.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1476 - POSTER BOARD # 9

Curricular Integration of Human Simulation Education Across Programs:SEGUE at the University of Pittsburgh School of Nursing

John O'Donnell, Richard Henker, Bettina Dixon, Helen Burns, Deborah White, Sandra Sell; University of Pittsburgh School of Nursing

INTRODUCTION: The University of Pittsburgh School of Nursing (SON) integrated full context simulation education using high fidelity human simulation into the graduate curriculum in 1994 and the undergraduate curriculum in 2001. Capability to offer more frequent simulation courses was limited due to simulator access and lack of faculty experience with the approach. In 2001, the SON purchased the Laerdal SimMan™ with an internal technology grant and constructed a fully equipped simulation lab. Several faculty served as thought leaders to advocate for use of this educational approach in both graduate and undergraduate curricula. With the opening of the Winter Institute for Simulation, Education, and Research (WISER) in 2004, opportunity arose for a top down curricular integration effort. An oversight committee titled Simulation Efforts in Graduate and Undergraduate Education at the School of Nursing (SEGUE) was constituted. This committee was composed of simulation experts within the SON with mandate to gather data with respect to current state of Nursing Simulation efforts, assure quality within all simulation educational efforts, and work in concert with undergraduate and graduate curriculum committees. The committee has matched SON simulation modules into an experience matrix reflecting clinical requirements established in the AACN (American Association of Colleges of Nursing) Essentials of Baccalaureate and Masters Education.

METHODS: SEGUE first met in September 2004. All courses in the undergraduate and graduate program utilizing HFHS mannequins were identified by faculty report. All simulation activities and hours per student for the 2005 academic year were recorded. Simulation scenarios within courses were stratified by body system. Data on student enrollment in each level of the undergraduate and graduate curriculum was obtained from the Department of Student Services. A meeting with School of Nursing faculty involved in human simulation education was held in December 2004. A simulation education meeting specific for nursing educators was planned for July 2004. All data was entered into a spread sheet and descriptive statistics were performed using Excel 13.0™

RESULTS: Total student simulation hours was collected per student, by level, and across the SON curriculum. Wide variability exists within the undergraduate level as well as between graduate programs. A total of 11,528 hours of hands on simulation was performed in 2005 (mean = 16.7 hrs. per student). A total of 593 out of 1050 students at the School of Nursing (56.5%) participated in a total of 133 Nursing Scenarios. The beta model of SimBaby™(Laerdal, Inc.) was used throughout the 2004–2005 academic year and programmed in eight separate scenarios. Cognitive, psychomotor, and affective elements were evaluated through multiple IRB protocols. Standardization of evaluation tools is underway with pilot tools in use across the SON simulation curriculum.

CONCLUSION: The integration of nursing simulation educational efforts has been a combination of grass roots advocacy and 'top-down' administrative support. SEGUE has helped to further stimulate and accelerate integration of the educational approach. Benchmarking goals linked to accreditation requirements is a powerful inducement for change. Subsequent work will focus on development of reliability and validity metrics.

Curricular Integration of Simulation Experience at the University of Pittsburgh School of Nursing

	Total Students	Annual Sim Modules	Avg. Annual Sim Hrs. per Student	Cumulative Hours in HFHS
Freshman (UG)	130	2	4	520
Sophomore (UG)	127	-	0	0
Junior (UG)	122	3	16	1952
Senior (UG)	111	1	8	888
Senior elective (UG)	20	2	16	320
Accelerated (UG)	20	2	16	320
Fast-Track-Back (RN)	10	2	8	80
Anesthesia (G)	110	10	56	6160
NP Programs (G)	60	2	16	960
Independent Study (UG/G)	10	4	32	320
Total	593	29	16.7	11528

UG = Undergraduate, G = Graduate, RN = RN Re-Entry to Practice Program

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1479 - POSTER BOARD # 41

COMBINING STANDARDIZED PATIENTS WITH SIMULATION TECHNOLOGY AT A NATIONAL SPECIALTY EXAMINATION

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Standardized patients (SPs), often lacking physical abnormalities, are frequently employed in high-stakes assessments of clinical competence. Incorporating simulation technology with SP assessments offers the advantage of standardizing patient abnormalities, provided that the assessment process demonstrates acceptable validity evidence.

The objective of this study was to develop, implement, and validate OSCE-format stations that combined simulation technology with SPs for the 2004 Royal College of Physicians and Surgeons of Canada's Comprehensive Objective Examination in Internal Medicine.

Digital audio-video simulations of cardiology and neurology physical abnormalities were included in 11 SP OSCE-format stations. Two examiners evaluated each candidate's performance. Reliability and validity data of the stations was assessed. Examiners were tested on a sub-set of the audio-video simulations. Inter-rater reliability for the audio-video simulations ranged from 0.83–0.85. Construct validity was addressed by assessing candidates' and examiners' diagnostic accuracy for a sub-set of simulations (mean score 0.79 +/- 0.26 and 0.84 +/- 0.24, respectively). Post-examination surveys confirmed face validity.

Incorporating simulation technology with an SP assessment represents a feasible and valid approach to the assessment of clinical competence in a high-stakes setting.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1480 - POSTER BOARD # 61

LAPAROSCOPIC SIMULATION, Who can be trained?

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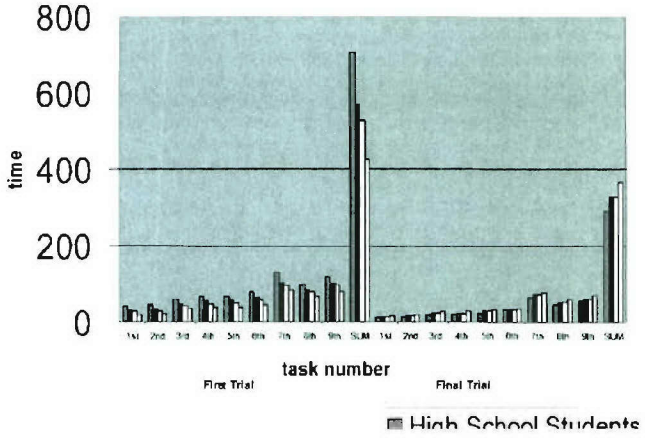
INTRODUCTION: Simulation is of proven values in medicine especially in minimally invasive surgery (MIS) training, as the acquired skills are transferable into the clinical practice. MIS is well known to have long and variable learning curves. If successive generations of surgeons were able to cut down on training time, and learning curves could plateau earlier with each generation of surgeons, then how early in the medical education can we integrate simulated laparoscopic skills?

MATERIAL AND METHOD: Thirty two trainees at various educational levels and ages were recruited to our study. Trainees were divided into four groups of eight individuals. The first group was composed of senior high school students, the second senior undergraduate college students, the third medical students, and the fourth PGY1 & PGY 2 surgery residents. The trainees were asked to perform nine successive assigned tasks, in a laparoscopic training box. Each task was repeated five times to assess the maximum efficiency of carrying out the skills.

RESULTS: Surgery residents carried out the first trial within the shortest median time (427 ± 46) second. There was no significant difference between the medical students (530 ± 70) seconds and the college students (573 ± 47) seconds. High school students exhibited the longest time in the first trial (706 ± 93) seconds.



At the end of the five trials the high school students were the fastest after repeating the tasks five times (289 ± 24) seconds. They were followed by the undergraduate students (329 ± 33) seconds and the medical students (328 ± 29) seconds. Interestingly the residents were the slowest (366 ± 52) seconds. **Conclusion:**

This preliminary data suggests that younger individuals may be able to acquire laparoscopic skills with more efficiency than more senior students and residents. This raises the larger question on how we may need to select future candidates for surgical training based, in part, on psychomotor information and skills acquisition. **Disclosure:**

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Other	Univeristy of Arizona - College of Medicine

ABSTRACT # 1481 - POSTER BOARD # 10

Recognition and treatment of unstable supraventricular tachycardia by pediatric residents in a simulation scenario

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BACKGROUND: Supraventricular tachycardia (SVT) is the most frequent form of symptomatic tachydysrhythmia in children. Therapy depends on the individual situation, but in severe hemodynamic compromise, it should be terminated immediately by external cardioversion. Despite this, no studies to date document whether pediatricians can differentiate "stable" from "unstable" SVT and make therapeutic decisions based on this discrimination.

PURPOSE: 1) To establish time to recognition and successful cardioversion of simulated unstable SVT by pediatric housestaff and 2) to document delays to initiation of and mistakes made during cardioversion.

METHODS: Utilizing Laerdal's' SimMan, ten different teams of pediatric residents were presented with an unresponsive patient who had narrow complex tachycardia with no P waves, low BP, and a weak pulse (i.e. unstable SVT). Events and time logs were downloaded from the simulator computer. Time to successful initiation of cardioversion was measured. Therapies instituted prior to cardioversion and mistakes made during cardioversion were recorded.

RESULTS: Ten scenarios were analyzed. Median time to successful cardioversion was 8.9 minutes (range 5.3 min to ∞). In 20% of scenarios, the patient was never cardioverted (1 due to lack of knowledge in defibrillator functionality and 1 due to lack of recognition for need to cardiovert). In 90% of scenarios, adenosine was given but 44% of those attempts demonstrated incorrect drug administration technique. Other maneuvers made prior to cardioversion were as follows: 70% gave fluid bolus, 60% attempted vagal maneuvers, 30% requested electrocardiogram, 30% requested an antiarrhythmic other than adenosine, 20% administered epinephrine, 20% requested a lab draw, and 10% requested cardiology consultation. In 20% of scenarios, the rhythm was misidentified (1 as ventricular tachycardia and 1 as sinus tachycardia). When cardioversion was performed, 25% failed to use gel with paddles, 37.5% failed to use synchronization, and 25% used an inappropriate energy dose. In 60% of scenarios, there was no oxygen administration. In 90% there was no formal assignment of Glasgow Coma Scale, and no assessment at all of mental status in 30%. In 60% there was no assessment of perfusion or capillary refill.

CONCLUSIONS: The median time to successful cardioversion of 8.9 minutes is inconsistent with the American Heart Association recommendation for treatment of unstable SVT with "immediate cardioversion" Many delays to cardioversion were secondary to lack of recognition of "unstable" SVT, due to failure to assess perfusion and mental status. Even with successful cardioversion, errors in technique and dosing were frequent. Mistakes and delays encountered during the SVT simulation identify targets for future educational interventions. When designing curriculum for pediatric housestaff, this data will be used to emphasize the importance of using definitive criteria to discriminate between "stable" versus "unstable" SVT, and to use this discrimination in therapeutic decision making.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1482 - POSTER BOARD # 11

Promoting Teamwork in Emergency Medical Services through Advanced Life Support Competitions

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INTRODUCTION: As Emergency Medical Services (EMS) practice moves to protocol-driven care, providers must be able to manage a multitude of emergencies in a team approach. Although teams and teamwork are a significant component of the pre-hospital medical delivery system, they are rarely included in training or quality improvement efforts. The most common model is to train and assess EMS providers as individuals, and expect them to naturally perform well as teams. EMS competitions may offer the opportunity for providers to effectively evaluate themselves against their peers in a competitive, high-fidelity arena with no risks to real patients.

METHODS: We followed an 11-step development process for each competition that includes development of Advanced Life Support (ALS) objective-structured clinical examinations (OSCEs) that are evaluated by an expert panel to ensure reproducibility, reliability and validity. Emphasis is also placed on the practicality of the OSCE, including scene design, use of standardized patients and simulators, effectiveness of evaluation tools, examiner training, and event logistics. A high degree of realism is embedded to enhance the patient representation and environmental surroundings. After each competition, formative feedback is given allowing teams to learn from their performance and a questionnaire, design to capture team characteristics is completed.

RESULTS: Since 1992 we have conducted 14 annual competitions involving 170 teams. Competing teams comprised of three pre-hospital providers, generally from the same department. Winning teams shared the following characteristics: consistent, organized approach to rapid clinical assessment and management, effectiveness leadership with clearly defined team roles, equipment customization and organization, patient and equipment centralization, routine practice to refine psychomotor and communications skills, local medical director support.

CONCLUSION: Many argue that experience is the best teacher. This is often dangerous for the patient and impractical for an EMS system to assess pre-hospital providers in their actual working environment. ALS competitions allow EMS providers to test their expertise in patient assessment, communication, and multiple emergent patient management problems as a team in a safe simulated environment.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1483 - POSTER BOARD # 12

Simulator-based Cardiac Life Support Rounds: the development of a novel inter-professional curriculum

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BACKGROUND: Medical schools are reevaluating their teaching systems in an attempt to become more accountable to their students while maintaining the importance of patient care and safety. Current trends in clinical teaching have evolved to facilitate learning in a way that understands the unique manner in which health care teams interact and treat patients.

PURPOSE: We sought to develop an inter-professional curriculum for nursing students, medical students, and junior medical residents using high fidelity medical simulation. Its purpose is to provide an opportunity for students to practice their basic resuscitation skills as a team, within a simulated clinical context, and to promote an appreciation and respect for each other's profession.

METHOD: The simulator-based inter-professional program consists of two hour sessions, held once weekly during the academic year. The sessions involve small groups of students working as a team through predefined simulated medical scenarios using high fidelity patient simulators. These scenarios are planned, implemented, and facilitated by physician and nursing faculty with an established interest in medical simulation. All sessions involve debriefing sessions to introduce, develop, and reinforce concepts of resuscitative care and crisis resource management and are facilitated by the faculty instructors. All students complete an anonymous evaluation of the program via a standardized questionnaire using likert rating scales. Participant scores are continuous from 1 (strongly disagree with statement) to 3 (neutral) to 5 (strongly agree with statement).

RESULTS: A total of 50 evaluations have been completed in the early stages of this program. Initial responses reflect a positive attitude toward this novel multi-professional program. There is universal agreement (n = 50) that these rounds add value to training (mean score = 5) and provide a vehicle for understanding team roles in resuscitation (score = 5). All participants agree, or strongly agree, that these rounds promote further desire for inter-professional (mean score = 4.7) and simulator-based medical training (mean score = 4.8), and should be mandatory for all medical and nursing students, as well as, postgraduate medical trainees(mean score = 4.8).

CONCLUSION: The simulator-based cardiac life support rounds are accepted uniformly among medical and nursing participants as valuable learning experiences. We believe this program is the first of its kind in Canadian medical schools and offers students an early opportunity for the development of crisis resource management skills in a protected simulator-based inter-professional setting.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1484 - POSTER BOARD # 13

Studying with the *Master*: Can We Assure Critical Thought in Critical Care? A Pilot Study

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House officers often struggle with diagnostic decision and focus, but few resources are available to train for critical thought outside the actual clinical environment. One-on-one faculty mentoring of residents used to be the cornerstone of clinical education, but such protected time is now subjugated to the demands of increasing patient flow and the reduction in resident work-hours. Although the advent of full-body patient simulators provides a safe venue for critical care training and evaluation, it has been challenging to integrate individualized teaching and assessment protocols within active residency programs.

PURPOSE: To pilot individualized faculty-resident training sessions in the simulator lab. We hypothesize that individualized clinical teaching, case review, and faculty evaluation can enhance the learning and evaluation process for apprentice doctors managing critical events.

METHODS: During the spring and summer of 2005, emergency medicine (EM) and internal medicine (IM) residents assigned to the MGH Emergency Department (ED) were offered the opportunity to spend a single hour in the ED-based simulator lab (MGH-Affiliated Simulation Training in Emergency Resuscitation [MASTER]). The lab was staffed with a paramedic educator who provided 4 ten-minute cases for the residents to navigate. Each case was developed to train and assess for critical diagnostic and therapeutic decisions in emergency and critical care medicine. Residents were assigned a faculty member to mentor them in real-time in the lab, or to meet and review a videotape of their performance at a later date. Faculty filled out a standardized scoring form and provided remediation as necessary; residents filled out a basic evaluation form. A DVD record of the encounter was made and archived.

RESULTS: Three MGH teaching staff (2 EM staff and 1 critical care fellow) completed 12 mentoring sessions as part of this pilot. Of the 11 residents (5 EM and 6 IM) who filled out an evaluation form, 10 of them (91%) rated the exercise as "excellent" (highest on a 5-point Likert scale). Nine of the residents (82%) indicated that the session "definitely" inspired them to pursue further learning. Commentary among the group included: "Feels just like real life"; "the most helpful part was having an expert review the case with me directly afterwards. . .I also found it very valuable to work in a solo environment where I am forced to make decisions alone"; "opportunity to try and handle acute situations on your own"; "real scenarios—forces you to make clinical decisions"; "always helpful to do simulation—especially alone!"; and, "very good to have 1 on 1 time with attending- . .liked getting objective scoring."

CONCLUSIONS: Individualized simulator-based training and evaluation is feasible within the infrastructure of busy residency programs. Such sessions can promote objective assessment and self-directed learning, and are highly valued by the residents.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1485 - POSTER BOARD # 14

How Valuable Are Longitudinal Simulation Exercises As Part Of An Integrated Clerkship?

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Realistic simulation exercises are usually conducted as an adjunct to traditional medical school curricula. Students typically have only a few exposures per year (at most), with each session lasting for 1–2 hours. Every year, however, students ask for more exposure to the simulator lab.

PURPOSE: To determine the feasibility and usefulness of expanding simulator use throughout the third-year clerkship experience. We hypothesized that simulation could be integrated into an existing clerkship plan with minimal resources and time, yet produce significant benefits to the students.

METHODS: During the inaugural year of the Cambridge Integrated Clerkship (2004–5), course directors and faculty agreed to pilot the expanded use of simulation within the clerkship curriculum. Each week of the curriculum was devoted to a core clinical topic. If faculty decided that realistic simulation would be useful in helping students to understand the topic of the week, they scheduled a 1-hour simulator session at the Center for Medical Simulation. On appointed weeks, students would leave the hospital and meet at the simulator lab in Cambridge (from 5–6 p.m. on Fridays). During these sessions, the relevant case material would be animated on the simulator. Four students would manage a clinical case as if they were interns in the hospital, while the other 4 would watch from the control room. After completion of the case (30 minutes), the entire cohort of 8 students reunited for a period of faculty-guided discussion and debriefing (30 minutes). At the end of the year, students were asked, "How valuable would you say the simulation exercises you completed this year have been to your development in becoming a competent physician (scale of 1–10)?

RESULTS: Depending on the topic and weekly faculty leader, simulation sessions occurred weekly to monthly throughout the year. Simulation topics included: shortness of breath, chest pain, heart failure, abdominal pain, pelvic pain, liver disease, headache, back pain, diabetes, hypertension, stroke, shock, electrolyte disturbance, substance abuse, and labor and delivery. The average rating of the simulator sessions among 8 clerkship students was 9.4 (scale 1–10). Five students (63%) rated the simulator experiences as 10 (extremely valuable to their development as a physician during the year); 2 students (25%) rated the exercises as 9, and one (13%) rated the sessions as 7. Commentary on written evaluations included "this was one of the most valuable experiences this year throughout" and "we did not have enough of them."

CONCLUSION: Longitudinal incorporation of simulation exercises into the clerkship year is feasible, and is highly valued by students. Based on this pilot, the Cambridge Integrated Clerkship will institutionalize weekly simulator sessions as part of their curricular plan.

ACKNOWLEDGEMENTS: Special thanks to Roxane Gardner, MD, & Toni Walzer, MD, for leading the labor and delivery module; and to Amanda Berube and Jordan Halasz for their technical assistance at the Center for Medical Simulation

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1486 - POSTER BOARD # 15

Moving The Patient Bedside Into The Tutorial Room: A Medical Classroom For The Future

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One of the goals of educational reform is to preserve the most effective components of traditional teaching while introducing new approaches that enhance learning. Such an integrative approach requires close collaboration and experimentation among faculty, educators, and students.

PURPOSE: To design and pilot a high-tech learning environment that enables the seamless integration between traditional pedagogy and the patient bedside. We hypothesized that such a classroom could provide a robust platform for testing a variety of educational approaches.

METHODS: A group of educators worked to conceptualize an all-inclusive Medical Classroom for the Future. The intent was to provide an environment which could bridge the lecture, tutorial, and laboratory experience of the preclinical years with the bedside teaching, advanced debriefing, and competency assessment of the clinical years. Each of four classrooms was outfitted (1) as a traditional small group tutorial room, complete with a blackboard and conference table, and (2) as a patient care room with a stretcher and high-fidelity patient simulator (which could also accommodate standardized patients). The two modalities (tutorial room and patient bedside) were paired side-by-side, and shared a touch sensitive plasma screen capable of high-resolution display and web-based networking.

RESULTS: Four integrated classrooms were exhibited at HMS for nearly 200 educators attending the 13-School Consortium and the AAMC Annual Meeting in Boston in the fall of 2004 ("An Expo of Educational Technology"). A case demonstration of asthma with pneumothorax was prepared and demonstrated, using all of the modalities embedded in each room. The case began with participants sitting around a tutorial conference table to discuss a New Pathway paper case. Subsequently the group got up from the table and turned to "meet" their tutorial patient—a simulator that began talking to them from the stretcher located just steps away. After interviewing, examining, and treating their "patient," the participants returned to the conference table, where they discussed the basic science of the case with the aid of web-based display material (MyCourses). Display adjuncts ranged from gross anatomy (annotated chest radiographs and gross pathologic specimens) to physiologic animation (dynamic diagrams with voice overlay from Human Systems Explorer), to virtual microscopy and pharmacology (identification of cellular receptors and structural material in the bronchial tree). Reactions to the demonstration were very positive.

CONCLUSIONS: A unified learning environment that integrates multiple components of the medical curriculum can be successfully constructed. Such a platform promises to be a useful setting for providing and testing a range of educational approaches.

ACKNOWLEDGEMENTS: Special thanks to Ron Arky for his support of the expo; Grace Huang, Michael Parker, John Halamka, Peter Weinstock, Emily Spilseth Binstadt, Tania Fatovich, Marisa Brett-Fleegler, Rodney Look, & Liana Stanley-Kappus for serving as expo faculty; Kitt Shaffer, Jason Alvarez, Rick Gillis, & Leanne Dunbar for helping to integrate web-based material into the program; the Office of Student Affairs for their administrative support; Bob Christiano and Paul Barkon for operational assistance; and METI, Inc. for providing simulators and sponsorship for the expo.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1487 - POSTER BOARD # 66

Resident Self-Efficacy Assessment is Poorly Correlated with Simulation Performance

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BACKGROUND: Self-efficacy assessment (SEA) is a common method of physician competency evaluation. Recent commentaries by Ward[1] and Colliver[2] have raised questions about the utility of physician SEA in relation to other "gold-standard" evaluation methods such as standardized patient exams or expert ratings of performance. Previously published work has shown a wide variation in the relationship between SEA and other measures, with correlations as low a 0 and as high as 0.82. In this study, we compare SEA to performance in simulation-based case scenarios.

METHODS: As part of a study of pediatric simulation-based assessment, first and second year pediatric residents from a single residency each completed two of four simulation scenarios, for a total of 104 simulation sessions. No resident repeated a case. For each scenario, a performance checklist was completed by three raters and a total score was calculated. The mean of the three scores was used as an overall global score. After each session, the resident recieved feedback on their performance and was asked to complete a survey including a SEA rating on a 0–100 visual analog scale. Subject's global scores were compared with their reported SEA rating and a Pearson's correlation coefficient (r) and a r^2 were calculated.

RESULTS: All 52 residents completed the SEA. The data are displayed in Table 1. For the asthma and supraventricular tachycardia data only, there is a significant relationship between self-efficacy and performance. Even for these two cases, however, the low r^2 values demonstrate that no more than 15% of the variation in performance scores is explained by the variation in SEAs.

CONCLUSION: Resident SEAs, at best, weakly predict performance in our simulation scenarios. This lack of association occurred even though the residents completed their self-assessment immediately after participating in a simulation scenario and receiving feedback on their performance. As has been shown in comparison to other outcomes such as standardized patient performance, SEA does not appear to be a robust method for predicting resident performance in simulated clinical scenarios.

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2. Colliver JA, Verhulst SJ, Barrows HS. Self-assessment in medical practice: a further concern about the conventional research paradigm. *Teach Learn Med.* Summer 2005; 17(3):200–201.

Table 1

Case	Pearson's r	r^2
Apnea	0.25 (p=0.23)	0.06
Asthma	**0.39 (p=0.04)**	0.15
Supraventricular Tachycardia	**0.39 (p=0.05)**	0.15
Septic Shock	0.06 (p=.76)	0.002

DISCLOSURE:

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Lecturer/Speaker	Medical Education Technologies, Inc. (Viva Jo Siddall)

ABSTRACT # 1488 - POSTER BOARD # 97

The Tumor: A Simulator for Open Surgery

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Few simulation tools for practicing open surgical skills have been developed. We have built and tested a device that allows a learner to practice careful dissection, hemostasis, tying off blood vessels with suture in deep locations, and control of massive hemorrhage. The device is inexpensive, applicable to a wide range of surgical specialties, and can produce robust measurement of skills.

The Tumor is a device that represents a generic vascularized growth in a non-specific tissue medium. It is constructed of readily available materials and can be discarded after each use. The tumor model is constructed from a pluot (a cross between a plum and an apricot, approximately 5 cm in diameter) that has been pitted, frozen and thawed. Gelatin tinted with food coloring in a plastic food bowl represents the surrounding tissue. The pluot is imbedded in the gelatin so that 25% of the fruit is exposed. Four lengths of Silastic rubber (1.47 mm ID, 1.96 mm ID) tubing are threaded through the pluot to represent blood vessels. A fifth length of tubing of greater diameter is located under the core of the pluot to enable simulation of massive hemorrhage. Solenoid valves are used to control the pulsatile flow of red fluid from a pressure bag through the rubber blood vessels. The model must be refrigerated prior to use, but remains stable for approximately two hours at room temperature. Surgical exposure can be adjusted by cutting a hole in the cover of the food bowl to a desired size. At any time, the controller can produce bleeding from one of the minor or from the major blood vessel via the solenoid valves.

A learner is instructed to resect the tumor carefully using a limited set of basic surgical instruments so that the margin is maintained with as little damage to the tumor body and surrounding tissue as possible. The tumor is described as vascular, friable, and that bleeding may occur as it is manipulated. Blood vessels must be cut and tied with 3–0 silk sutures to keep blood loss to a minimum.

We have used the tumor model to engage surgeons during simulations centered on team training as a means to more closely replicate surgical tasks in the actual operating room. The nature of the model requires coordination with assistants and scrub nurses and also makes their jobs during simulation more realistic. The ability to create massive hemorrhage also allows for the creation of simulation scenarios based on the surgical field itself, a departure from scenarios that are often anesthesia based.

We hope to expand the use of the model in the future as a training device and possibly as a measure of surgical skill and judgment after validation studies to correlate surgical experience with technical performance on the model.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1490 - POSTER BOARD # 52

Faculty Development for Simulation Based Education and Training Programmes. Can a national standard be created in the UK?

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In the past 12–18 months there has been a significant increase in enthusiasm to explore the opportunities of simulation-based education and training in healthcare within the UK. This has been accelerated by the published experience of existing advanced simulation training facilities nationally and internationally, an ever increasing focus on patient-centred care along with requisite risk management and safety strategies, and more recently by the increased availability of affordable whole-body manikins from several international manufacturers.

As a result it seems worthy to consider whether this is an appropriate time to develop a project defining standards for the training of suitably skilled healthcare 'educators' who will be involved in the future development and delivery of simulation-based training across the UK. It will be important to make this project accessible and relevant to the broad range of undergraduate and postgraduate educators currently involved in simulation and clinical skills training as the distinction between these concepts is becoming increasingly blurred.

There are several components to consider within the project:

(a) Defining appropriate educational skills and techniques available (e.g. instructor, coach, facilitator) and recognising that some individuals will have experience of these attributes whilst others will need development.

(b) Identifying the spectrum of resources available to support simulation-based education (e.g. part-task trainer, whole body manikins, advanced simulator facilities, use of actors) and exploring how to co-ordinate and make best use of these resources.

(c) Describing the elements that support the development and delivery of a simulation-based educational programme, including course design, equipment familiarity, debrief and feedback skills, evaluating effectiveness.

(d) Clarifying the values to the individual of becoming involved in simulation-based education by providing evidence linking practice as an educator with professional development in the workplace.

(e) Contributing to the process demonstrating value of simulation-based education to the employer, both by training delivered to staff as well as providing the opportunity to link into risk management strategies.

(f) Working with employers and standard-setting organisations and institutions within healthcare and higher education to gain recognition and achieve consensus for such a standard to exist.

The next stage proposed for this project is to raise awareness of its profile both within the UK and abroad, gather opinion and support from all interested parties, and to consider how best to take forward its development and co-ordination.

Our presentation will summarise progress to date with the project in the UK, and identify the links made with other interested groups internationally who have had experience of persuing this type of concept. We will also present a mind-map which provides a visual representation of the issues involved and some of the potential key benefits that may be realised at an individual and organisational level.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1491 - POSTER BOARD # 59

Development and Validation of High Fidelity Patient Simulator Case Scenarios for Pediatric Resident Evaluation

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BACKGROUND: Valid measurement instruments are necessary to assess residents' clinical competency. Evaluating the skills needed to care for seriously ill children is difficult given the rarity of serious childhood illness. Use of high-fidelity human patient simulation (HPS) systems allows this type of evaluation to be conducted efficiently.

OBJECTIVE: To develop and validate a series of critical illness HPS case scenarios for pediatric resident evaluation.

DESIGN/METHODS: In this two year project, we developed four HPS-based case scenarios (CS). Each CS consisted of a script and an un-weighted checklist rating tool with 22–32 items. After initial CS creation, we conducted 80 testing scenarios over 11 months. This process allowed for the iterative revision of the script and checklist, removing or revising aspects that did not work in practice. In this first year, three raters completed checklists for each resident scenario; this also served as a training process for the raters. In the second year (Validation Phase), an equal number of first and second year residents completed two sessions each, for a total of 104 sessions. Feedback was provided at the end of each session. Reliability is reported for each checklist: Kappa (κ) and Brennan and Prediger's adjusted kappa[1] (κ_n) for inter-rater reliability and Cronbach's alpha for inter-item reliability (α). Global checklist scores are reported and mean scores for first and second year residents are compared for discriminative validity. Subject satisfaction and self-efficacy data were collected.

RESULTS: Data are summarized in Table 1. For all of the scenarios except sepsis, there was a significant difference in scores between years. Inter-rater agreement values are moderate. All participants reported that they learned new information and that this experience will help with patient care. Significant errors were noted during evaluation including failing to ventilate an apneic child (62% of residents) and failing to check the serum glucose in an unconscious patient (73%).

CONCLUSIONS: Data derived from resident responses to our pediatric CS's have acceptable levels of inter-observer reliability and discriminative validity. The CSs were met with high levels of resident satisfaction. Clear gaps in knowledge were identified which will serve as a starting point for a future simulation-based educational intervention.

REFERENCE 1. Brennan R, Prediger D. Coefficient Kappa: Some uses, Misuses and Alternatives. *Educ. Psych. Meas.* Fall 1981;41(3):687–699.

Table 1

Case Scenario	Overall Mean Score	1st Years	2nd Years	κ	κ_n	α
Asthma	67.1%(±3.6%)	**61.9%**	**72.3%**	.77	.87	.52
Apnea	66.8%(±3.8%)	**62.3%**	**71.3%**	.72	.83	.40
Supraventricular Tachycardia	66.5%(±4.4%)	**61.0%**	**72.4%**	.55	.75	.54
Sepsis	68.7%(±4.4%)	65.6%	71.6%	.62	.79	.62

Bold Entries - difference significant at $p < 0.05$

DISCLOSURE:

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Lecturer/Speaker	Medical Education Technologies, Inc (Viva Siddall)

ABSTRACT # 1493 - POSTER BOARD # 53

The Current Role of Medical Simulation in American Urological Residency Training Programs

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INTRODUCTION AND OBJECTIVE: A number of simulators have been recently introduced to develop surgical skills for urological residents. Current training involves traditional education techniques and the use of box trainers, but is largely subjective. To what extent and how surgical simulators are being utilized in training urology residents remains unknown. We evaluated the current status of simulator training in U.S. urological training programs.

METHODS: The Accreditation Council for Graduate Medical Education recognizes 119 urology training programs across the United States. An anonymous questionnaire was developed and sent to each of the program directors. This survey consists of 15 questions that document the presence of various simulation methods and an additional 14 questions using a 5-step Likert scale (1=strongly disagree, 5=strongly agree) that disclosed their impact. The replies were analyzed for discrepancies, and the answers reported.

RESULTS: Based on the initial survey distribution, thirty-seven (31%) questionnaires were returned. Access to a laparoscopy simulator was reported in 73% of the programs. While few programs use the laparoscopy simulator for testing (17%), most report the simulator is a good educational tool (85%) and realistic (69%). A low prevalence was reported for access to cystoscopy (15%), transurethral resection (6%), ureteroscopy (20%), or percutaneous access (11%) simulators. These trainers were noted to be educational, easy to use, and realistic. There was a mixed reaction regarding the educational value and ease of percutaneous access simulators. There was agreement between program directors that there is a role for simulator training (4.38, standard deviation= 0.681), that residents would willingly participate (4.19, sd= 0.701), and that simulators allow practice in a controlled environment (4.50, sd= 0.609) and allow defined teaching objectives (4.19, sd= 0.668). There was considerable disagreement on whether simulators are an adequate substitute for "hands-on instruction" (2.81, sd= 1.05), can be easily incorporated into the curriculum (2.65, sd= 1.21), have been validated (3.0, sd= 0.986), or will be needed for training in the era of the 80-hour work week (3.50, sd= 1.16).

CONCLUSIONS: Access to laparoscopic training devices for urology residents appears to be widespread, while access to other endoscopic simulators is minimal. Urology residency program directors recognize the educational value of simulators, although the extent to which they may be incorporated remains to be resolved.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1495 - POSTER BOARD # 17

Perceptions of Experiencing Simulated Death

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OBJECTIVE: To obtain feedback from trainees completing medical simulation training programs regarding their opinion on experiencing a simulated death.

METHODS: Retrospective analysis of quality assurance surveys inquiring about perceptions of simulated death. The sessions occurred between April and November 2004. A total of 63 physicians and 175 non-physician Air Medical Crew (AMC) paramedics and nurses participated.

RESULTS: Survey data was received from 62 physicians (98%) and 162 AMC personnel (93%). Fifty-four physicians (32 residents (60%), 22 attendings (40%)) completed the survey. One-hundred sixty-two AMC with 86 nurses (53%), and 67 paramedics (43%). Sixty-one AMC crew members (40%) and 33 physicians (61%) reported experiencing a simulated death. A Likert scale with 0 as strongly disagree and 4 as strongly agree was used.

Participants experiencing simulated death disagreed that simulated death impaired their ability to learn. Physicians reported with a median of 1 (Interquartile Range (IQR) :0–1), paramedics with a median of 0 (IQR:0–1) and nurses with a median of 1 (IQR:0–2). Physicians agreed that the simulated death likely correlated to actual patient death or severe injury with a median of 3 (IQR:2–3). All agreed that they would expect the simulator to die if that was the likely outcome of the case with the physicians reporting a median of 3.5(IQR:3–4), paramedics with a median of 3(IQR:2–4) and nurses with a median of 3(IQR:2–4). They strongly disagreed that there would be a future reluctance to participate in simulation training because of a death. All reported a median of 0 (IQR:0–1). All participants strongly disagreed that simulated death is inappropriate regardless of the medical management reporting with a median of 0 (IQR:0–1).

All disagreed that death during simulation should be withheld from student training with physicians reporting a median of 1 (IQR:0–1), paramedics and nurses strongly disagreed and reported with a median of 0 (IQR:0–1). All participant disagreed that a separate disclosure of potential simulator death was needed with a median of 1 (IQR:0–2).

CONCLUSIONS: Participants did not find simulated death distracting to learning. Participants felt that students of their respective fields should be allowed to experience simulated death. No group felt that a separate disclosure of the possibility was needed.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1497 - POSTER BOARD # 103

Applying Learning Object Principles To Simulation: The Anesthesia Machine Pre-Use Check

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INTRODUCTION. Recent preliminary survey results indicate up to 80% non-compliance worldwide with the general recommendations to check an anesthesia machine before every case [1]. Lack of knowledge and inadequate instruction were among the most cited causes for non-compliance [1] suggesting a worldwide need for education and training, given the reported impact of the pre-use check and its documentation on patient safety [2].

OBJECTIVES: With Anesthesia Patient Safety Foundation funding, we set out to develop a free, transparent reality, web-disseminated simulation of the current US Food & Drug Administration (FDA) checklist (ca. 1993) that is reusable for (a) other national/regional checklists, (b) forthcoming new FDA recommendations, (c) different audiences (anesthesiologists, CRNAs, techs, vets) and (d) different machine designs, thus facilitating collaborative, efficient and fast deployment of e-learning.

Methods. To facilitate reuse, we applied learning object (LO) principles to simulation to create reusable simulation learning objects (SLO). A learning object (a) is reusable, (b) contains content, practice and assessment components and (c) is meta-tagged so that it can be intelligently identified by search algorithms to promote its reuse. A LO can consist of any kind of instruction format such as text, graphics, audio, video, multiple choice questions and simulations. In our definition of SLOs, implemented with Director (Macromedia, San Francisco, CA), we used only simulations and further subdivided the content, practice and assessment components into stand-alone simulations, individually invoked via unique URLs. The initial state of each simulated step in the FDA checklist is defined via a corresponding XML file. In the content SLOs ("see one"), users are taught how to perform a given test while simultaneously learning how to use the simulation; a "Rationale" button explains why each test is performed. An intelligent tutor provides tiered levels of assistance during practice SLOs ("do one"). In the assessment SLOs ("test oneself"), learners have to perform a procedure correctly and in the right sequence and then judge whether a randomly configured machine passes or fails a given test.

RESULTS: The simulation of the US checklist at http://vam.anest.ufl.edu/learningobjects consists of 44 content, 45 practice, and 19 assessment SLOs. Casting the individual steps of the FDA checklist as SLOs and the text instructions as reconfigurable XML files more than doubled the time to implement the simulation. However, as a result, we were able to produce in an hour a simulation-enhanced version of the Australian and New Zealand College of Anaesthetists' checklist (at the above URL) via reuse of the SLOs created for the US checklist. Similarly, a Chinese version of the simulation is already available.

Discussion. Preliminary results are that our SLO approach has facilitated reusability and will provide finer granularity and control in reusability, sequencing and assessment. Our initial experience with display-based SLOs suggests that it may be worthwhile to investigate applying LO principles to physical simulator scenarios to facilitate sharing and consistency in providing content, practice and assessment via full-body simulation.

REFERENCES:

1. Anesthesiology 103:A1195, 2005
2. Anesthesiology 102:257–68, 2005

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1498 - POSTER BOARD # 71

Transparent Reality Simulation of Perioperative Hemostasis: Preliminary Development and Implementation

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INTRODUCTION: Classical models of hemostasis have failed to adequately explain in vivo observations of coagulation and coagulopathy, especially in the perioperative setting in which multiple complicated processes affect the final hemostatic outcome. A new conceptual model of hemostasis, the cell-based coagulation model, has supplanted the classical model because it elucidates these in vivo observations. Anesthesiologists play a central role in correcting perioperative coagulopathies as well as preventing abnormal thrombosis. Although simulations exist, none exist that specifically illustrate the complex, dynamic perioperative setting and no simulation allows users to see how their interventions effect hemostasis.

OBJECTIVE: We propose the creation of a novel, interactive, internet-based simulation of perioperative coagulation to better educate all involved in the perioperative care of patients in current concepts of hemostasis, appropriate utilization and interpretation of coagulation tests and proper treatment of perioperative coagulopathy. Methods: In keeping with the goal of simulating hemostasis in the perioperative setting, we focus on clinical aspects based on basic science. To facilitate understanding, we apply transparent reality simulation techniques that allow users to interact with the model of hemostasis and visualize the essential effects of their interventions on hemostasis within a surgical setting.

Results: As of this writing, the various concepts that have been explored for interactively simulating hemostasis can be viewed at http://vam.anest.ufl.edu/hemostasis. We will demonstrate our evolving work at the IMMS meeting in January 2006.

DISCUSSION: Despite anesthesiologists' central role in perioperative hemostasis, we hypothesize anesthesiologists have a poor understanding of the current cell-based coagulation model, utility of coagulation tests and management of perioperative coagulopathy. This may lead to inaccurate interpretation of coagulation tests, over-utilization of certain treatments in lieu of more effective treatments and potentially suboptimal patient care. We hypothesize the use of an interactive, transparent, perioperative hemostasis simulator will increase anesthesiologists' appropriate utilization and interpretation of coagulation tests, institution of correct interventions and ultimately improvement of perioperative outcomes. Once our transparent reality simulator is complete, we will conduct a multi-institution study to test our hypothesis using anesthesiologists at various levels of experience. Questionnaires administered pre-intervention, immediately post-intervention and several months post-intervention will assess the effectiveness and retention of our education tool.

DISCLOSURE:

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Grant support	NovoNordisk

ABSTRACT # 1499 - POSTER BOARD # 18

Progress on the Development of an ASA-sponsored National Anesthesiology Simulation CME Program

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INTRODUCTION: The American Society of Anesthesiologists (ASA) organized the Workgroup on Simulation Education under the Committee on Outreach Education, to determine interest, feasibility, and methods of developing an ASA-sponsored national (and perhaps standardized) anesthesiology simulation CME program. **Methods.** The Workgroup (Dr's. Olympio (Chair), Barach, Bateman, Cole, Cooper, Gaba, Gravlee, Levine, Loyd, Quinlan, Ruskin, Schaefer, Steadman, Seropian, Sinz, Taekman, Torsher, Weinger, Wilks, and Janice Plack) conducted 12 conference calls and 2 meetings. Eight Goals were established to 1) create a web-based listing of simulation opportunities, 2) determine ASA-member interest in simulation and consider standardized course development, 3&4) develop an ASA process for approving high quality programs and instructors, 5) develop promotional schemes, 6) investigate provision of CME and measurement of outcomes, 7) develop a business plan, and 8) determine capability of centers to participate. Internet research and marketing, mass mailings, and administrative meetings were conducted.

RESULTS: Known anesthesia simulation entities were identified and subsequently invited to participate in the newly developed ASA website registry (via www.asahq.org), which provides a searchable database of leadership, affiliation, URL, program description, equipment, resources, courses and availability of CME. Similarly, company names and types of equipment offered were listed for manufacturers. All anesthesia simulation entities are encouraged to participate. Additionally, centers were asked to complete an "ASA Survey of Simulation Centers", and asked to participate in a promotional "Simulation Saturday" on March 11, 2006. The survey probed for their interest in participating in the ASA CME project, length, time, and type of courses they offer, and numbers of instructors, participants, experience, and physical/administrative attributes of their centers. Response frequency is low at this time. Subsequently, a letter and "ASA Member Poll on Simulation CME" was mass-mailed to all active ASA members, generating over 1100 responses. Preliminary interpretation reveals only 22% had participated in simulation CME, (of which 94% indicated a positive experience). Of all respondents, 81% were interested in future simulation CME, with 60% favoring common events, 89% for rare events, 63% for teamwork skills, 81% for crisis resource management training, 53% for FOB but 79% for invasive airway management, 55% for TEE, 72% for regional anesthesia, 68% for ultrasound-guided CVC, 49% for multidisciplinary, 51% for videotaping, 71% for formal assessment. The highest percentage (83%) wanted local training. Only 2% said they were uncomfortable with, or not interested in simulation. "Simulation Expo", a live and dramatic video conference of an anesthesia crisis, was approved for ASA 2006. Extensive deliberations continue to focus upon methods for the ASA to promote and approve an enlarging subset of high-quality participating simulation centers and instructors.

DISCUSSION: Results to date indicate that ASA-sponsored simulation education in anesthesiology is highly desired by its membership and enthusiastically supported by the ASA and its Workgroup. Further advertising and development among simulation centers is necessary to expand a high quality learning opportunity for ASA members.

DISCLOSURE:

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Other	Chairman, ASA Work group on Simulation Education

ABSTRACT # 1500 - POSTER BOARD # 19

Introducing a Pilot OB/GYN Residency Simulation Program

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BACKGROUND A new simulation program has been introduced into the OB/GYN residency curriculum via a joint effort between the Center for Experiential Learning (CEL) and the OB/GYN department at the James H. Quillen College of Medicine, East Tennessee State University. This pilot program was designed with the long term goals of both education and resident assessment. Prior to the development of an assessment tool, simulation was first introduced as an educational component within the residency curriculum. Because simulation is novel to OB/GYN residency training, resident acceptance of simulation within the educational curriculum is crucial prior to full program implementation. To determine resident acceptance, post-exercise surveys were completed by the participants.

METHODS: Cases were developed by CEL faculty based on learning objectives created by the OB/GYN faculty. Example cases used during this pilot program included ruptured ectopic pregnancy, malignant hyperthermia, ovarian hyperstimulation syndrome, hyperkalemia, mitral valve stenosis, neonatal resuscitation, and hyperthyroidism. All simulation and debriefing activities were carried out in the CEL using both CEL and OB/GYN faculty members. The CEL uses the METI HPS, Laerdal SimMan, Noelle, and other internally developed simulation equipment. One or two simulation cases were used during separate three hour simulation and debriefing sessions. Post-exercise surveys were conducted, to gauge resident acceptance. Survey items believed to indicate acceptance were as follows:

- The scenarios covered today were realistic.
- I learned information that I can directly apply to my clinical work/practice.
- Today's session will influence how I interact with patients.
- There is adequate opportunity to discuss communication and leadership components of the exercise during debriefing.
- I would like to return to the Center for similar exercises.

RESULTS: The survey data show that all resident participants agreed or strongly agreed to the statements gauging resident acceptance.

CONCLUSIONS: Simulation as a curriculum component during residency is accepted by OB/GYN residents. This will allow for further development of the pilot program, introducing simulation as an assessment tool in the OB/GYN curriculum.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1501 - POSTER BOARD # 20

Using Simulation to Teach Communication with Pediatric Patients and Their Families

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BACKGROUND: Effective, empathetic, and professional physician-patient communication and interaction are complex and difficult skills to learn. Training in these valuable skills is often inadequate in medical schools and residency programs. These essential skills of communication between physician and patient become imperative when dealing with pediatric patients and their families. We used a combination of standardized patient actors (SPs)and a pediatric human patient simulator (pHPS) to train anesthesiology residents appropriate communication skills. We also explored the rationale for family presence during medical procedures.

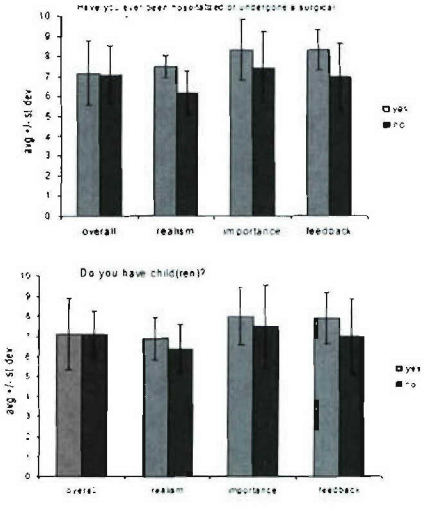
MATERIAL AND METHODS: Senior anesthesiology residents (PGY-3,4) participated in 3 simulated scenarios designed to encourage reflection about how best to communicate with pediatric patients and their caregivers. Each scenario involved two different residents, while the remaining residents observered. Each scenario was followed by short debriefing.

The first scenario was a routine encounter with a family in the preoperative area. The residents were expected to establish rapport, obtain a history and physical exam, answer questions, and obtain informed consent from the caregivers. Debriefing focused on communication and medical skills. The second scenario utilized the pHPS as the same child now accompanied to the operating room by a parent (SP) for induction of anesthesia. A small crisis was created as the child developed laryngospasm and the parent became concerned. Debriefing focused on the interactions of the residents with the family during the crisis and then moved to a discussion of the rationale for family presence during medical interventions.

The third scenario focused on delivering bad news to parents (SPs.) The residents had to explain that a child in their care required multiple attempts at IV placement and now must remain intubated postoperatively due to an unexpected response to a drug they gave. Finally the residents were asked to answer a short questionnaire about the session.

RESULTS: The residents gave the exercise an overall rating of 7.1 +/-1.5. Table 1 compares the response of those who have personally encountered the medical system vs. those who have not yet. Interestingly, most of the residents who have children (47%) felt that this fact changed how they interact with other parents(71%.) Of residents who have had sick children, all said this experience had changed the way they now interact with other parents of sick children.

CONCLUSION: By combining the methods of both SPs and the pHPS we created a valuable and highly rated learning experience. The actors allowed the residents to practice and learn interpersonal communication skills and the pHPS allowed concurrent practice of crisis management skills.



CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1503 - POSTER BOARD # 48

Civilian Medical Simulation Centers as a Regional Resource for Training and Skill Sustainment of Reserve Component Medical Personnel in Combat Casualty Care

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INTRODUCTION: Reserve Component (Army National Guard and Reserve) medical personnel have limited training time and resources to maintain skills in mission essential tasks. Limited refresher materials and sustainment training are available through Web-based training. Advanced medical simulation (SIM) exercises at civilian simulation centers may be developed into a regional resource for improved Reserve Component (RC) personnel medical training.

METHODS: RC military physicians and nurses experienced in treating combat casualties collaborated with civilian simulation center staff to develop a SIM-based training and refresher course for RC medical personnel. Simulation participants' input was used to continuously enhance the practical relevance of training exercises and to assess the feasibility of military medical training in a civilian simulation facility.

RESULTS: A curriculum consisting of focused didactics, skill stations and SIM scenarios was constructed from combat experiences of RC personnel previously deployed in Afghanistan and Iraq. One four-patient and three single-patient cases exposed learners to high-velocity firearm injuries, landmine amputations, rocket-propelled grenade and improvised explosive device blast injuries, and vehicular blunt trauma. The multi-patient scenario required ethical decision-making and triage processing during the simultaneous care of friendly and enemy combatants. Two of six planned sessions, each scheduled to enroll at least ten RC personnel, have been completed. Feedback from participants has been rapidly incorporated and dynamically updated SIMs after completion of each session. Course development and logistic experience is being compiled to provide insight for future RC SIM implementations. Data acquisition on skills retention at short-term followup sessions and on the effect of learners' varying combat experience on clinical performance during SIMs is ongoing.

CONCLUSION: Civilian medical simulation centers close to RC medical units may offer a key solution to providing meaningful training experiences for soldiers otherwise unable to use similar Army resources at more distant locations.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1504 - POSTER BOARD # 21

Use of a High Fidelity Pediatric Patient Simulator to Train Transport Personnel

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INTRODUCTION: The recent establishment of an RN/RT pediatric transport team (CHETA) at the University of Wisconsin (UW) Children's Hospital prompted the development of a curriculum for training CHETA personnel for the transport of critically ill children. Although CHETA personnel are experienced in the care of critically ill children and all are staff in the pediatric intensive care unit, only 28% of the personnel had experience in inter-hospital transport of a critically ill patient. A training program was therefore developed with the goal of providing a realistic training environment for learning technical skills and medical protocols. Additionally, the program sought to develop the teamwork and communication skills which are necessary for a successful transport team.

METHODS: The human patient simulator laboratory (HPSL) at the UW Hospital was modified to simulate a referring hospital emergency room with a critically ill pediatric patient requiring inter-hospital transport. A curriculum was developed to provide initial training for CHETA personnel in two three-hour sessions. The first training period emphasized proper technical skills including bag-valve-mask ventilation, endotracheal intubation, defibrillation/cardioversion, intraosseous line placement, and use of the laryngeal mask airway. The second training session was used to present medical scenarios simulating critically ill pediatric patients and emphasized familiarization with medical protocols and transport equipment. This session also stressed the development of communication skills and team building. The trainees completed a pre and post-training survey that provided information about their level of experience in clinical and simulation environments. The survey also asked for a self-assessment of their cognitive and technical abilities. Self-assessment of the participants' skills and their evaluation of HPSL training was performed using a five-point Likert Scale (1-strongly disagree, 2-disagree, 3-neutral, 4-agree, 5-strongly agree)

RESULTS: Twenty-two CHETA personnel attended both training sessions (11 RNs, 11 RTs). Three others only attended the first session (3 RTs). Participants of the HPSL training reported improvement in their familiarity with use of transport equipment (3.4 pre vs 4.0 post)and felt more comfortable in their role as a member of the transport team (3.7 vs 4.2). CHETA team members reported improvement in their ability to perform all of the technical skills. Overall, the participants described the HPSL learning experience as one that prepared them for the transport of critically ill children (4.6) by improving procedural skills (4.5), defining team member roles (4.7), and by providing a realistic (4.5) and safe (4.8) training environment. Every participant felt HPSL training should be used in the training of medical personnel (5.0). Participants did not report an improvement in their ability to recognize and manage medical conditions or in their ability to use the transport ventilator.

CONCLUSION: High fidelity human patient simulation provides a safe and realistic training environment to aid personnel in preparing for the transport of critically ill children. Participants in the training became more familiar with their role as a transport team member and developed important procedural and communication skills during the training.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1505 - POSTER BOARD # 104

All Aboard, Let's Go: How to Bring Your Coworkers to the Sim Side

Mindi A. Anderson; University of Texas at Arlington School of Nursing

This poster will focus on practical strategies to facilitate others within an institution to adopt patient simulation as a teaching strategy. One of the underlying concepts of the Diffusion of Innovation Theory is that with any new technology, there are those who are innovators, those who are early adopters, those that are early majority adopters, those who are late majority adopters, and those that are late adopters (Rogers, 1983). This poster will discuss and display planning and implementation strategies on how to get individuals involved at different levels of readiness.

Examples of strategies highlighted will include: use of an institutional simulation newsletter where faculty can share their simulation success stories; simulation task force for tool and scenario design, along with simulation research planning and conduction; educational workshops for faculty; and a Gantt chart for simulation curriculum diffusion. Creative web interaction through supportive use of WebCT for faculty and a nursing in simulation resource website will be shown.

DISCLOSURE:

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Other	Laerdal, Center of Excellence/Scenario Writing/Grant Funding

ABSTRACT # 1507 - POSTER BOARD # 22

The Use of Blended Simulations In Medical Education

Diane Ferguson,[1] Lisa Rawn[2]; [1]The University of Texas Health Science Center at San Antonio, [2]Uniformed Services University of the Health Sciences

INTRODUCTION: Computer patient simulators, part-task trainers, and Standardized Patients (SP's) are predominate modalities used in teaching and assessing a learner's clinical competencies in medical education. While these have traditionally been used independently, there is increasing interest in integrating these two methods to teach and assess a broader range of skills. There have been discussions at recent conferences regarding the need to further the relationship between the medical simulation and standardized patient communities. With some evidence of the advantages of more realistic and broader simulation encounters and competing funding for the use of both modalities in medical education, dialogue between these two groups is vital. The authors will identify some current projects that blend the two technologies and provide resources for those interested in beginning collaborative projects.

PROJECT DESCRIPTION: A survey was sent to a list serve of Standardized Patient Educators to gather information on current or planned uses of standardized patients with other forms of simulation technologies. The survey asked participants to identify current uses of SP's with simulators. Additional information was then requested about each acknowledged use such as a brief description of the blended exercise, whether the exercise was used for teaching or assessment, the level of learner, and any research initiatives.

OUTCOMES: The results of the survey will be presented and examples given of the specific uses of blended simulations, current or proposed research, and contact information for those interested in dialogue.

CONCLUSION: Although there is indication that the integration of these methodologies is minimal, there is a need to identify the current uses and institutions that are using blended simulations to facilitate further development and research. The future of simulation education may likely take the path of integration and collaboration between the standardized patient and computerized simulation communities.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1508 - POSTER BOARD # 67

Simulation Based Intervention as an Effective Teaching Tool for Teamwork and Pediatric Airway Skills

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High fidelity medical simulation is an evolving tool, currently used by many institutions to teach medical students, residents, and other medical personnel. However, there is limited data on its efficacy as an educational intervention.

To evaluate high fidelity medical simulation as an educational intervention for teaching emergency pediatric management teamwork and airway skills, we performed a prospective, case control, observational study, using 16 PGY-2 pediatric residents. All subjects were PALS/APLS certified, and had no prior experience with medical simulation. Residents were given a brief intro to the sim center, and then managed 2 scenarios, during which their baseline airway and teamwork skills were assessed. The participants were divided into groups 1 and 2. Group 1 returned to the simulation center for a full-day, simulation enhanced session on pediatric airway management and teamwork skills. Two months later, groups 1 and 2 underwent reassessment of their performance. Following the second assessment, group 2 returned for the same educational intervention as group 1. Finally, both groups returned for a final assessment. During the assessment sessions, data were collected using the RIHMSC Global Competency Score (a Likert scale for subjective competency scoring), the Behaviorally Anchored Rating Scale (BARS), a previously validated teamwork metric (MedTeams™, Dynamic Research Corporation, Andover, MA), and critical action checklists specific for each scenario.

Results from the Global Competency Scores (range 1–7) and the BARS scores (range 1–7) are displayed below in tables 1($p<0.05$ for both RIHMCSGCS and BARS).

The results for successful intubation attempts, appropriate RSI, cricoid pressure and ETCO2 during the 96 total scenarios are also recorded in Table 1(p0.05 for all critical actions).

The global competency scores show a statistically significant correlation between the intervention and performance. The BARS scores improved with each session, although the educational intervention did not correlate with the improved performance. Critical actions show a trend of improvement, but this trend was not statistically significant. Our data support simulation as an effective tool for teaching teamwork skills and improving global competency in an emergency pediatric setting.

Table One

Session and Group	RIHMSC GCS	BARS	Succ Int Att	RSI (appr)	Cric Press	ETCO2
Session 1 Gr 1	3.7 (+/-0.15)	4.6 (+/-0.19)	80%	50%	50%	56%
Session 2 Gr 1	5.5 (+/-0.14)	5.2 (+/-0.19)	87%	87%	50%	44%
Session 3 Gr 1	6.3 (+/-0.14)	5.4 (+/-0.22)	89%	94%	73%	80%
Session 1 Gr 2	4.9 (+/-0.14)	4.9 (+/-0.21)	92%	81%	50%	13%
Session 2 Gr 2	4.1 (+/-0.14)	5.3 (+/-0.18)	77%	100%	69%	63%
Session 3 Gr 2	5.9 (+/-0.14)	5.5 (+/-0.19)	84%	100%	50%	81%

RIHMSC GCS=RIHMSC global competency scale, BARS=Behaviorally Anchored Rating Scale, Succ Int Att=successful intubation attempts, RSI(appr)= appropriate RSI, Cric Press = cricoid pressure, ETCO2=end tidal CO2 detector

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1509 - POSTER BOARD # 54

Developing a simulated environment for pediatric radiotherapy education

David E Wiljer,[1,2] Normand Laperriere,[1,2] Susan Awrey,[1] Audrey Jusko Friedman,[1] Heather Guscott,[1] Jones Erin,[1] Barbara-Ann Millar,[1,2] Sharon McKinnon,[1] Christa Surka,[1] Pamela A Catton[1,2]; [1]Princess Margaret Hospital/University Health Network, [2]University of Toronto

BACKGROUND: In pediatric radiation, educating patients and their families is a complex undertaking that poses many challenges. Immersive, simulated environments provide a unique opportunity for empowering patients so that they can become and engaged and active participants in their care. This presentation explores strategies for the development of a simulated educational environment for pediatric radiation patients and their parents. Radiation for Kids encourages learning and participation through a dynamic and realistic environment that is modeled on the actual treatment process. Children create their own character, meet their treatment team and explore treatment areas through realistic, age-appropriate isometric representations, interactive activities and informative animations.

MATERIALS AND METHODS: The iterative, four-stepped research process integrates several proven techniques: Step 1: Needs Assessment including an environmental scan and a literature review; Step 2: Concept and Design Document with content development, storyboard reviews, and semi-structured and "think aloud" interviews with patients; Step 3: Prototype Creation including the development of an interface, treatment simulations, interviews and usability tests; Step 4: Program Development including the production of all multimedia elements and usability testing.

RESULTS: Based on a thorough needs assessment that revealed the importance of interactivity, realistic environments, visual communication and frequent consultations with end users, content scope and user needs were identified and prioritized. A detailed development document was then presented to clinical educators (n=5) and patients (n=9) ranging in age from 4 to 13. A detailed, interactive prototype has been constructed and usability tests conducted with patients and parents (n=16). Participants are indicating that they prefer a realistic, detailed, warm and "healthy" environment so that they can identified and relate to their experience.

CONCLUSIONS: The evolution of this program reflects the importance of simulated, interactive environment for educating patients who are anxious and overwhelmed. The research has demonstrated the benefits of seeking continuous feedback from target audiences using a variety of techniques and the importance of a multidisciplinary approach. Preliminary results indicate that a realistic, simulated environment may help patients prepare for the experience of radiation therapy, but further research is ongoing to understand the optimal use of this approach.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1511 - POSTER BOARD # 50

Value Of Virtual Reality Simulator In Assessing Laparoscopic Skills: Italian Experience Among Surgical Academic Institutions

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INTRODUCTION: In the Surgical Schools the assessment of skill acquisition and actual technical competence has received poor if any objective attention. At least in the laparoscopic field the virtual reality simulators can help the educators in shortening learning curves in surgery and possibly predict future operating room performance. This is an experimental teaching project granted by the Italian University and Scientific Research Ministry (MIUR) carried on among four Surgical Departments in Padua, Verona, Pisa and Rome-Tor Vergata Universities

MATERIAL AND METHODS: A LapSim virtual reality simulator (Surgical Science Ltd., Goteborg, Sweden) is being utilized during the current research program. The first step of the program was to enrol four training groups: 1) 4–5th year postgraduated surgical residents (number 30) with poor laparoscopic experience, 2) medical students with no experience at all (10), 3) well qualified surgeons with large experience in the laparoscopic field (10) 4) and non medical students with reported practice with video games as control group (10). All were first-time users of virtual reality simulator. They underwent several training sessions with only one final increase in difficulties. In the second step, surgical residents already trained and evaluated were send to perform a cholecystectomy in a well certified live animal laboratory (UCCS Center of CNR in San Piero a Grado, Pisa). Their technical skills in the porcine model were assessed by independent observers using a new scoring methods for assessing the operative errors

RESULTS: During the first two sessions of training no statistical differences were found among the groups. Only later (from 3 to 6 attempts) experienced surgeon and successively the surgical residents appeared to be able to perform the basic tasks with less errors in a quicker time. Even so statistically significant evidences ($P < 0.05$) were reached in the more surgical specific manoeuvres such as clip applying and suturing. At the moment 12 residents were evaluated after performing cholecystectomy in the pig and were ranked by the blind observers according with number of operative errors as previously defined. The results were compared with the scores obtained in the simulator during the basic task sessions. The first data analysis shows a fair correlation between the results in the simulator with the score given in the surgical procedure (Pearson's coefficient = 0.715).

CONCLUSIONS: Virtual reality simulator appears a valid training and assessment tool of laparoscopic skills. However even the more experienced surgeon need time and exercise to acquire confidence with the new technology. Time and exercises number required to show statistical distance between novice subjects and experts as well as task difficulty are not yet well established. The skills acquired or showed in a virtual reality simulator seem to correlate with the ability to perform a real surgical procedure, even if more data are to be obtained. The individual learning curves of surgeons beginning with laparoscopic tasks are to be well studied and understood in the view of adopting an effective virtual reality training program in the academic institutions and recommending the simulation technology in the general surgical education curriculum.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1512 - POSTER BOARD # 23

The Use of Patient Simulators for Residency Competency Evaluation

Jason Christensen,[1] Paresh Patel,[1] Carl Skinner[2]; [1]Darnall Army Community Hospital, [2]Fort Leonard Wood Hospital

BACKGROUND: Evaluating clinical competency without jeopardizing patient safety is a challenge in residency education. Simulation Medicine is becoming a more integral part of Emergency Medicine residency education; however its effectiveness in assessing resident clinical skills for independent practice has not been validated.

PURPOSE: We set out to demonstrate the effectiveness of simulation medicine in evaluating clinical competency.

METHODS: First through third year Emergency Medicine Residents at Darnall Army Community Hospital were given end of the year clinical evaluations by Staff Emergency Medicine physicians using patient simulators to evaluate basic Emergency Medicine care based on year of training. First,second and third year Emegency Medicine Residents were evaluated using patient simulators on basic Emegency Medicine care based on year of training. At the end of the simulation lab, 19 residents and 5 staff physicians were given confidential survey regarding how effective they felt the simulated patients were in evaluating clinical skills on a scale from 1–5 (1=poor, 2=fair, 3=good, 4=very good, and 5-excellent).

RESULTS: Staff Emergency Medicine physicians felt their evaluation of residents on simulated patients had good correlation with what they see on actual clinical shifts, with a mean survey score of 3.33. Residents also felt simulated patients were very good in evaluating their clinical skills, with a mean score of 4.05 (3.70–4.40, 95% confidence interval). Residents and staff both found the end of the year Simulation Day lab to be a fair way to evaluate clinical competency skills, with mean scores of 4.05 (3.82–4.29, 95% confidence interval) and 4.6, respectively.

CONCLUSION: Residents and staff feel patient simulators serve as a useful tool in end of year clinical evaluation of competency.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1514 - POSTER BOARD # 40

Development Of A Simulation-Based Orientation To A Rural Medicine Immersion Experience: A Pilot Project

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DESCRIPTION: Simulations (using standardized patients, manikins, or a combination) can be used effectively with medical undergraduates as an alternative to lecture (see Gordon 2002). This paper describes the development, implementation, and outcomes using each of these simulation modalities in a 1-day orientation to prepare 30 3rd year medical students for 9-month clinical rotations in rural communities. Since so many of these students will work in under-resourced areas (and will, therefore, take a more active role in providing patient care), it was vital that the clinical content and the scenarios mirror the diversity of cases they are likely to encounter and assist students in evaluating and improving essential procedural skills.

METHODS: The authors worked together to create educational objectives, write 8 clinically relevant cases, recruit and train standardized patients, recruit and orient clinical faculty, develop acute care algorithms for human patient simulators, adapt simulators for specific scenarios, and evaluate student outcomes using both quantitative and qualitative data. Thirty students (who applied for the rural physician training program) participated in the day-long orientation. Cases ranged from a pediatric URI to labor and delivery management and treatment of a post partum hemorrhage. Cases were clustered by the urgency of the chief complaint (i.e. primary care, acute care) with different amounts of time allotted for each clinical scenario (30 and 45 minutes respectively). Students were randomly divided into 8 teams. Each student completed a survey with perceptual, attitudinal, and self-evaluative items following completion of the primary care and acute care stations. Each student also participated in a verbal debriefing following the acute care stations and completed an evaluation of the orientation as a whole at the end of the day. Nine clinical faculty were also surveyed regarding their perceptions of student outcomes.

RESULTS: Qualitative and quantitative data indicated that 1. students improved their confidence in preparation for their rural rotations; 2. students refreshed or gained new clinical skills in preparation for acute clinical situations; and 3. students felt that using this range of simulation modalities was an efficient and effective educational methodology that should be applied across the medical school curriculum. Results will be compared to evaluations 3 months into student rotations and again at the conclusion of the 9-month experience.

CONCLUSIONS: The combination of simulation methodologies was successful. The event will be repeated and evaluated similarly in the future. Longitudinal assessments will be used to revise the orientation and assist in ongoing development of the pre-clinical curriculum.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1515 - POSTER BOARD # 24

Team Leaders Have A Narrowed Perception Of Communicative Team-Factors During Simulated Emergency Scenarios

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AIM: To test, if there is a difference in the perception of medical and/or communicative factors between the team leader (L) and his assistant (A) during simulated emergency situations. Methods: 29 emergency physicians (EP) were each placed twice in the roles of L and A. Self assessment (SA) by standardized questionnaire after each simulation. Video-assisted objective assessment (OA) by two external observers using a previously validated check list. Interobserver reliability analyzed by intraclass correlation coefficient (ICC). Z-standardized values of the medical and communicative data analyzed by the Pearson correlation (r). Results: High interobserver reliability (ICC between 0.82 and 0.94). Positive correlation between medical and communicative behavior ($r = 0.52$/ $p<0.0001$). SA of A correlates significantly better than SA of L with objective assessed communicative/ behavioral team factors (Table). Conclusions: Emergency physicians as team leaders do not show any correlation between SA and OA with regard to team factors. When Emergency physicians change their roles and work as assistants, SA and OA show significant correlations in three of six communicative factors. The best correlation is obtained by combining, the SAs of both, leader and assistant, which argues for investment in Crew Resource Management. Research agenda: To test whether good medical team performance is obtained by good communicative behavior or vice versa. To determine if there are other reasons that explain this excellent correlation.

Table: *p<0.01; **p<0.05; ***tendencies p<0.10 (only shown for smaller samples)

	Medical performance	Time management	Delegation (L)	Communication (L→A)	Team cooperation	Overall communicative behavior
r (L)	0.34*	-	0.38***	-	-	-
r (A)	0.26**	0.50*	0.38***	0.45**	0.46**	0.45**
N	36–38	21–24				

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1516 - POSTER BOARD # 96

Training on the Virtual Reality Simulator CATHI Improves the Procedural Skills in Novices of Coronary Interventional Procedures- An Experimental Study Using a Pulsatile Coronary Flow Duplicator

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Progress in computer technology has promoted computer-based simulators. CATHI is a virtual simulator, which provides a realistic teaching environment for coronary interventions. It has a haptic interface to the original instruments and devices used in the cath-lab. CATHI produces a synthetic x-ray image of the coronary tree. We assessed the hypothesis that CATHI can improve the hand-eye coordination and total procedural quality of beginners performing coronary interventional procedures.

12 participants without any experience in interventional cardiology were randomized and underwent either simulation (Gr. 1: n=6) or pure computer based training with keyboard and mouse only (Gr. 2: n=6). Afterwards, each test-person had to perform a coronary intervention in a pulsatile flow model containing different target lesions. This procedure was performed in the cath-lab under fluoroscopic guidance. All steps of the intervention were objectively assessed according to a standardized form to determine a personal "skill-score" as a parameter of over-all procedural quality. The skills-score took different components into account, e.g. the usage of the X-ray-unit, the manipulation of the wire and the catheter, the risk-adapted behaviour and the amount of assistance, which was necessary during the procedure.

Simulator training (Gr. 1) resulted in a reduction of procedure and radiation time compared with computer based training (gr. 2); In contrast, the skill-score was significantly higher in group 1 than in gr. 2 (31.0 vs. 23.6; $p=0.016$). Training with the virtual simulator, CATHI, significantly improved the procedural skills of beginners. This may mainly be explained by the training effect itself, but also by the improved self-confidence, which the beginner gained by the simulator training. The teaching effect of CATHI in more experienced interventionalists has to be evaluated in further studies.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1519 - POSTER BOARD # 82

Explicit Communication in an Obstetrical Emergency

Toni B Walzer,[1,2] Hajime Kobayashi,[3,4] Roxane Gardner,[1,2] Daniel B Raemer[1,5]; [1]Center for Medical Simulation, [2]Department of Obstetrics and Gynecology, Brigham and Women's Hospital, [3]Harvard School of Public Health, [4]Nippon Medical School, Japan, [5]Department of Anesthesia and Critical Care, Massachusetts General Hospital

INTRODUCTION: One of the hallmarks of a high-performance team is the use of a common language during emergency situations. In domains where formed teams are the typical organizational structure, clear conversation using common terms is especially important to avoid misunderstandings and to reduce the communication burden. We believe that labor and delivery teams might benefit from standardizing vocabulary during obstetrical emergencies. To understand the current vocabulary used we observed the declaration of a relatively common obstetrical emergency, shoulder dystocia, during a simulation exercise.

METHODS: Obstetricians, labor nurses, and anesthesiologists participate in a simulation-based teamwork course at the Center for Medical Simulation on a weekly basis. All participants are post-graduate practitioners with a wide range of experience (6mo to >30yrs) from one of 14 different institutions. One of the case scenarios presented is an unanticipated shoulder dystocia using an apparatus we have described previously[1] Investigators reviewed a sample of 12 videotapes randomized within institutions from a pool of 46 to document the vocabulary used in declaring the emergency. The obstetrical maneuvers that were used initially to relieve the shoulder dystocia were also recorded.

RESULTS: The most common terminology used was: "shoulder dystocia" (33%), "we have a shoulder" (33%), "get a stool" (20%), and "it's stuck" (13%). All participants used the McRoberts maneuver and/or suprapubic pressure as their first maneuvers to manage the shoulder dystocia. There were no apparent misunderstandings between the team members that were observed.

DISCUSSION: Although we saw no obvious sequela, we noted a variety of terms used to declare this critical event. During debriefings the most common reason cited by the obstetrician for not using the term "shoulder dystocia" was a desire not to alarm the patient and family. We remain concerned that the lack of a common terminology could result in misunderstanding and a delay in treatment during this critical event. We hope to develop a universal practice of declaring a shoulder dystocia by its technical name throughout our obstetrical practices.

[1] Walzer TB, Gardner R, Raemer DB. Obstetrical Emergency - an Apparatus to Simulate Shoulder Dystocia. Anesth Analg, 2004; 98 S39

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1520 - POSTER BOARD # 94

Let's See What Happened: Development Of An Innovative Quad Screen Technology For Comprehensive Recording Of Interdisciplinary Team Training In A Virtual Operating Room Environment

John T Paige,[1] Valeriy V. Kozmenko,[1] Thomas Frye,[2] Barbara Morgan,[1] David S Howel,[1] Sheila Chauvin,[1] Isidore Cohn,[1] James P O'Leary,[1] Charles W Hilton[1]; [1]LSU HSC, [2]Stryker

INTRODUCTION: The operating room (OR) is a fast paced, dynamic environment in which cohesive team function is essential for patient safety. Simulation based interdisciplinary team training is an attractive model for helping foster better teamwork because it allows group rehearsal in a low risk, yet realistic setting. One of the many challenges of such training is capturing pertinent data in a viewer friendly format for educational and evaluative uses. At Louisiana State University (LSU), we have developed a useful quad screen technology for viewing and recording the interdisciplinary team training sessions in crisis management that we conduct in our virtual operating room environment.

METHODS: The simulated scenarios occur in a fully equipped minimally invasive OR suite that houses a computer operated mannequin and a virtual reality laparoscopic cholecystectomy machine. The interdisciplinary OR teams consist of a senior general surgery resident, a nurse anesthetist, and circulating nurse. Participants wear microphones, and the session is recorded. Output from the room camera, mannequin, and the virtual reality machine is routed through a mixer that reconstitutes it into a viewer friendly quad screen format. In this manner, the activity in the virtual OR, the mannequin's vital signs, and the progress of the virtual procedure itself are simultaneously projected onto a large viewing screen for teaching purposes. A recording of the quad screen is then used for debriefing and evaluation. A sample video will be shown.

RESULTS: We have now conducted six sessions using the quad screen technology. It provides a viewer friendly format for projecting multiple events in the operating room environment. It is especially useful for illustrating salient points during a simulated scenario, both during the session and in the debriefing afterward. Technical issues include combining analog and digital output simultaneously on the screen.

CONCLUSION: We have successfully developed a quad screen technology for simultaneous viewing of events in a virtual operating room environment. Future plans include incorporating an events log within the quad.

DISCLOSURE:

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Employee	Timothy Frye is a Stryker employee who helped in developing, installation and adjustment of the quad system

ABSTRACT # 1521 - POSTER BOARD # 83

Complex Multiple Team Interactions During The Management Of Paediatric Emergencies: Use Of Advanced Simulation To Identify Team Development Needs

Richard Bowker,[1] Bryn Baxendale[2]; [1]Dept. Paediatrics, Queens Medical Centre, Nottingham UK, [2]Trent Simulation & Clinical Skills Centre, Queens Medical Centre, Nottingham UK

Prompt and appropriate management of any paediatric emergency in the hospital setting requires several factors to combine successfully within the context of extreme time pressure. When such a situation arises within the Emergency Department of a UK acute hospital, the immediate assessment and management plan will be initiated by the medical and nursing team present. The team leader will also initiate an urgent referral to the appropriate paediatric emergency admission team (usually medical, surgical, or critical care based), representatives of whom will then attend to review the patient and institute further management as deemed necessary.

After reviewing clinical incident summaries locally and nationally we became aware of a number of common themes that contributed to this process of care becoming compromised or to break down completely with significant implications for patient outcome. We decided to make use of an advanced patient simulation facility to explore these themes with experienced clinical teams from the acute hospital setting, and to discover if individuals or teams as a whole were able to identify any key development needs in order to prevent or minimize the risk of intra- or inter-team dysfunction when performing under stress.

Medical and nursing representatives of a paediatric Emergency Department team and a relevant paediatric admission team (ie critical care, surgical, or medical) were invited to attend the training day. The day comprised a series of scenarios in which attendees participated or observed their colleagues, followed immediately by video-enhanced feedback and group debriefing.

Several key themes were explored during the day, and were reinforced by means of faculty-led workshops interlaced between the scenarios. These themes included: (a) Leadership and teamworking when two teams from separate backgrounds were in attendance, (b) Communication processes including handover of critical information within each team and between members of separate teams, (c) Exploring the management of conflict of opinion and challenging decisions and priorities when the two teams were working alongside one another.

Key outcomes from each of these days to date have centred on the added value that the attending teams have identified for themselves over and above that which they have gained previously from different types of education and development training. Commonly they have identified specific improvements necessary within their own working protocols and guidelines, and have expressed the desire to repeat the simulation training day to explore how best to implement any operational changes being considered. Another outcome has been identifying the need to recognize and acknowledge the experience and skills being brought to a critical situation by other staff, whilst not becoming disempowered by feeling uncomfortable about challenging decisions and priorities initiated by team leaders or other members.

An area of disappointment remains that despite having identified several crucial areas for personal and team development as a result of these training days, it has become difficult to develop the days further because there is not a history or culture for multiprofessional team training in the UK using this type of approach.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1522 - POSTER BOARD # 77

An Immersive High-Fidelity Simulator Based Teaching For Anesthesiology Nursing Students Results In A Steady Improvement Of Performance In Trainees

Valeriy V. Kozmenko, Barbara Morgan, Alan Kaye, Kathleen Wren, Charles Hilton; LSU HSC

INTRODUCTION: Operating room is a dynamic and fast paced environment that requires from medical personnel excellent theoretical knowledge, effective critical thinking and ability to work in stressful conditions. Immersion is a critical component in learning how to effectively function in OR. At Louisiana State University (LSU), we have developed an immersive high-fidelity simulator based context specific course for training anesthesia nursing students.

METHODS: Teaching sessions occur in a fully equipped virtual OR. The following interactive scenarios comprise the course: simple intravenous induction into anesthesia, thermal injury with smoke inhalation, multiple trauma with tension pneumothorax and internal bleeding, intraoperative wheezing due to bronchial asthma exacerbation, intraoperative anaphylactic reaction, malignant hypothermia and intraoperative septic shock. Outcomes in these highly dynamic authentic scenarios depended on the students' ability to identify the problems and correctly prioritize the interventions. Literature review and our prior experience show that occasional exposure to the problem does not produce long lasting improvement in performance. To produce steady results, let the students to experience each case multiple times in alternating order slightly modifying the patients' descriptions. For each case we have developed case specific assessment check lists that were used to measure and monitor students' performances. The students worked on each case in random order as many times as was needed until they demonstrated a steady improvement in the patient's assessment, differential diagnosis and treatment. We followed each session with a guided debriefing during which the students reflected on their performances.

RESULTS: As the course progressed, we observed several phenomena: developing of suspension of disbelief during the sessions, unbiased assessment of personal skills and knowledge, more effective management of the OR stress, demonstrating better competence in disintegrating complex problems into the smaller components, more effective prioritizing of objectives in a dynamic environment, shifting from external to internal gratification and demonstrating steady behavioral patterns resulting in the successful outcomes of simulated cases.

CONCLUSION: Multiple exposures to the authentic dynamic and highly interactive simulation cases in the immersive environment result in an improvement in clinicalreasoning and behaviors. Our future plans include expanding of the variety of cases.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1524 - POSTER BOARD # 88

Consulting By Robot: Clinician-Patient Communication Via Mobile Telepresence

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BACKGROUND: Mobile telepresence via remotely-controlled robot offers innovative alternatives to traditional care. Senior clinicians can monitor patient progress at distant locations, providing advice to less experienced colleagues. Because the technology is so new, little is known about the skills required for remote presence (RP) consulting. The extensive literature on patient-centred communication during clinical interviews is based on face to face interactions. This study aims to develop and evaluate a communication guide for clinicians undertaking RP interactions. It is based on skills used in other patient encounters and draws on research into videoconferencing and media presentation skills.

MATERIAL AND METHODS: Six scenarios reflected a range of frequently encountered clinical conditions with a range of patient ages and characteristics (e.g. deaf, angry, insistent, reticent, unable to speak English and resistant to new technology), using simulated patients (trained actors) to present each role. Trainee surgeons used a remotely controlled RP6 mobile robot to consult with each patient in a simulated emergency department or surgical ward setting. A written guide to RP communication was evaluated, using a pre- and post-test design. Simulated patients rated their satisfaction after each encounter and identified helpful and unhelpful communication behaviors. Clinicians completed a post-test written evaluation to identify and prioritize communication skills for effective for patient-centered interactions.

RESULTS: Five trainee surgeons each completed 6 clinical encounters (n=30). All found the communication guide helpful and perceived that it improved their skills. There were no significant differences between before and after scores based on simulated patients' ratings. However, responses to open-ended questions provided important feedback for development of the guide. Key areas include awareness of difficulties with RP communication, such as non-verbal communication (only the clinician's face is visible to the patient) and reduced access for clinicians to contextual cues (other ward activity, reduced visual field). A notable finding was the clinicians' perception that in the ward setting, RP enabled them to focus on the patient more easily since they were not distracted by other ward activities.

CONCLUSION: The study's primary outcome is a revised communication guide which has wide application in RP clinical interactions and possibly other areas of telemedicine. Full evaluation was not possible within this brief intervention, as any new skill set requires sustained deliberate practice and individual feedback. Future studies will evaluate the guide and consider ways in which more effective learning strategies can be incorporated.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1525 - POSTER BOARD # 42

Computed Medical Simulation Program To Assess Final-Year-Residents' Clinical Decision Making Ability To Enhance Patient Safety In Japan

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INTRODUCTION: There are demanding needs to create effective evaluation tools to assess Japanese final-year-residents' clinical skills in the end of two-year mandatory general clinical rotating training, which was newly and nationally introduced in Japan in 2004. Among variety of important clinical abilities that residents' need to develop by the end of the second year, it will come as a first priority to make accurate clinical decisions within limited time with consideration of patient safety. With ethical and financial consideration, introduction of computed medical simulation program can be feasible and beneficial.

METHODS: Since January 2004, the committee for computed medical simulation program in the Department of Health Services Administration at Nippon Medical School, Tokyo, Japan, has been actively involved in creating a pilot medical simulation program to evaluate Japanese final-year-residents' clinical skills. The six members are consisted of three pediatric, gastrointestinal, and trauma surgeons, one internist, and one research student at the department. We chose three common medical symptoms which could cause serious medical outcomes; abdominal and chest pain, and headache. At this point, a computed simulation program with utilizing animation was created on abdominal pain, the others are in the process.

RESULTS: The situation is at an exam room, and a graphically-drawn male patient sits in front the examinee, complaining of abdominal pain. An examinee can choose to conduct vital signs, physical exams, order labs, and fill in medical records. The monitor also shows pain level, given time (1,000 seconds, i.e., approximately 16 minutes), virtual time at the clinic. Guideline of the original scenario (diagnosis: gastric perforation) was created by the committee, based on the doctors' clinical experience. Variety of outcomes can be made by examinees' decision makings. The monitor would be ended automatically when the patient's pain level becomes maximum and/or virtual and/or given time end up. After completing the program, feedback is made according to outcomes verbally by the examiners.

DISCUSSION AND CONCLUSION: Advantages of this program are: 1. This program enables us to maintain the same examination quality each time; 2. Patient safety is guaranteed; 3. Updating the program is relatively easy, and the cost is lower than a manual exam. Our future steps are: 1. Completing to create the other two symptoms; 2. Discussion on feedback system to change from verbal feedback to programmed one; 3. Program evaluation to test its validity and reliability to apply to the residents.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1527 - POSTER BOARD # 90

Remote Presence Support and Tutoring of Surgical Skills

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BACKGROUND: Telemedicine support of non medical staff taking on extended roles is well documented but is limited by the immobility of 'static' telemedicine systems. New mobile technologies have the potential to allow a novel method of remote support to healthcare practitioners. The aim of the study was to evaluate the perceptions of students and their tutor as regards remote tutoring using a Remote Presence telemedicine robot (RP6) tutoring Perioperative Surgical Practitioners (PSPs) in surgical skills.

METHODS: PSPs attended a structured, certificated course in skin ellipse excision and primary suture on a simulated bench top model in a skills centre. A surgical tutor provided group and individual tuition via the RP6, controlling the robot remotely from another site and 'visiting' each participant repeatedly during the session. Group teaching and individual tutoring were provided via the robot, while demonstration of key techniques using a software program ('Suture Tutor') was mediated by an assistant. Participants and tutor were interviewed using a semi-structured topic guide exploring perceptions of the session to evaluate the feasibility of remote presence tutoring. Interviews were audio recorded, transcribed verbatim and analysed by two researchers independently. Key themes were discussed within the research group

RESULTS: Ten PSPs took part in the study. No impairment in the quality of teaching was reported, and the novelty of the robot was rapidly replaced by normal rapport with the tutor. Demonstration of the tasks and one to one tutoring was perceived as being satisfactory. Reduced non verbal cues from the tutor were noted as well as the need for clear verbal instruction. Technology dependent issues such as visual resolution, driving the robot and positioning of the tutor's face on the robot screen were potential areas for improvement. The tutor perceived that he was able to maintain good rapport with the participants and deliver effective teaching both individually and as a group.

CONCLUSIONS: Support and tutoring of surgical practitioners using mobile telemedicine robots is feasible and acceptable. Ideally groups should be small, and tutors should gain video conferencing communication skills. Effective remote tutoring may offer reduced travel time, cost savings for both practitioners and expert tutors, and potential for worldwide remote availability of experts.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1528 - POSTER BOARD # 25

Individual Debriefing vs. Computer Based Multimedia Instruction After Patient Crisis Simulation

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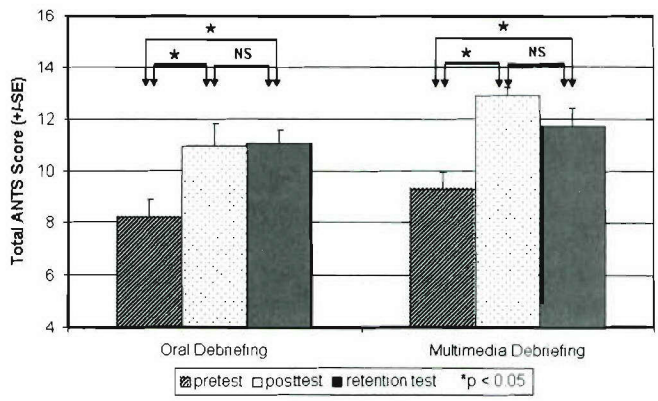
BACKGROUND: Several advantages of simulation over didactic and patient dependent teaching have lead to a proliferation of patient simulators in academic centers. Although simulation experience alone seems insufficient for learning, research evaluating different modes of instruction following simulation is lacking (1). Standardized multimedia has shown to be useful in teaching surgical skills, but has not been evaluated for use as an adjunct in crises management training. The primary purpose of this study is to determine whether standardized computer-based multimedia instruction is effective for learning in patient crises scenarios. The secondary purpose is to compare multimedia debriefing to personal oral debriefing with an expert.

METHODS: Thirty anesthesia residents were recruited to manage three different simulated resuscitation crises using a high-fidelity patient simulator. Following the first scenario, subjects were randomized to either a computer-based multimedia tutorial or a personal debriefing with an expert followed by a posttest and retention test five weeks later. To date, the performances of 20 residents were independently rated by two expert blinded assessors using the previously validated Anesthesia Non Technical Skills (ANTS) marking system (2).

RESULTS: Resident performance of non-technical skills improved significantly in both groups compared to pretest $p<0.05$). The improvement was sustained after five weeks for both groups ($p<0.05$)(see Figure). No significant difference in the performance of residents receiving either type of debriefing was demonstrated in any of the tests.

CONCLUSION: Computer based multimedia instruction is an effective method of teaching non-technical skills in simulated crisis scenarios and may be as effective as oral personalized debriefing. Multimedia may be a valuable adjunct to centers when debriefing expertise is not available. Multimedia may also improve simulation utilization by reducing anxiety of peer evaluation in continuing medical education.



(1) Savodelli GL et al., submitted 2005. (2) Fletcher G et al., Br J Anaesth 2003; 90 (5) 580–588.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1529 - POSTER BOARD # 62

Attending Anesthesiologist Responses to Resident Challenge: The Two-Challenge Rule

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INTRODUCTION: In aviation, the "two-challenge rule" is a principle where a subordinate is obligated to challenge a superior when it's believed an unsafe action has been taken. If there is no answer, or a nonsensical answer, the subordinate is empowered to escalate the challenge and ultimately take control of the aircraft. A modified two-challenge rule for healthcare has been advocated in patient safety literature where "taking over" is replaced by "calling for help." In a prior simulation-based study, anesthesiology residents were reluctant to challenge questionable practices of an attending anesthesiologist. This follow-up study examines the responses of attending anesthesiologists to challenges made by residents.

METHODS: In a simulated operating room, scripted residents challenge decisions made by an attending anesthesiologist (subject). The scenario is an elderly patient (70s) having an elective repair of a humerus fracture under interscalene block and general anesthesia. Relevant past medical history includes hypertension treated with hydrochlorothiazide. While the subject watches from a remote location, a confederate anesthesia team comprised of a simulator faculty attending and resident induce general anesthesia. There is disagreement about proceeding with the operation following discovery that the patient had a small amount of orange juice in the waiting area. After an uneventful rapid sequence induction, the attending is called to another room. The departing attending requests that the subject anesthesiologist supervise the resident described as "difficult to work with." The patient goes into rapid atrial fibrillation (HR ~ 150; SBP ~ 75). Using a structured technique based on the aviation two-challenge rule, the resident challenges medical decisions made by the subject. Videotapes from ten scenarios were reviewed by a single investigator (RHB). Number and type of subject actions and subject response to the resident's challenge were noted. Subject response was coded to note if the challenge was acknowledged and whether an explanation was given. Acknowledgments were coded as "none," a "simple" verbal response, or "complex," meaning the subject acknowledged their management was being challenged. Additionally, the quality of an explanation for the action, or for rejecting the challenge, was coded as *adequate* or *inadequate*. The absence of an explanation was coded as *inadequate*.

RESULTS: Of 10 cases evaluated, 45 challenges were identified (average 4.5 per case; range 2–8). Subjects' choice of therapy for atrial fibrillation was: medical 28/45 (62%), electrical 7/45 (16%), and other 10/45 (22%). 5/10 (50%) of the subjects requested and received help from another attending anesthesiologist. Subject responses to the resident challenges were: none 5/45 (11%), simple 30/45 (67%), and complex 10/45 (22%). The subjects' explanation to the resident was judged *adequate* 21/45 (47%) and inadequate 24/45 (53%).

CONCLUSIONS/DISCUSSION: Anesthesiologists' responses to resident challenge demonstrated that over half of the challenges were not accompanied by an adequate explanation of the rationale behind the attending's decision-making. In the authors' opinions, these are lost learning opportunities for residents. Of greater concern is risk to patient safety when the resident suggestions are ignored or suppressed due to the position of authority of the attending.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1530 - POSTER BOARD # 26

Integration Of Trauma Surgical Simulations In Terms Of An Osteosynthesis-Training And A Surgical Approach-Workshop In The Surgical Curriculum For Medical Students In Frankfurt

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BACKGROUND: Student training in the trauma department takes place mainly in the emergency room and in the operating theater. In our experience, a large number of students seem to be overwhelmed with the complex duties in the OR especially with respect to the team, sterility and patient handling. Therefore, they are unable to focus on the actual operation itself.

AIMS: To give students the opportunity to participate in an advanced hands-on curriculum of trauma surgery techniques in the absence of the above mentioned distracting factors.

DESIGN: We first concentrated on the training of osteosynthesis techniques with artificial bones. In this setting, the students were able to gain extensive experience with the instruments, the different implants and their biomechanical characteristics. As a second step we combined these obtained procedural skills with anatomical knowledge performing a variety of surgical approaches and osteosynthesis using cryo-fixated corpses. Thereby the students had a chance to review the anatomical structures more intensively based on the surgical task. Using this training method, the students were able to build a basic knowledge for their future learning experiences in the operating theater setting.

CONCLUSION: Simulations are a valid tool in trauma surgery education, since they allow students to concentrate on particular techniques or approaches. Artificial bone training followed by a simulation employing cryo-fixated corpses seem to represent adequate and logical substitutes to obtain advanced skills. This is necessary to ensure that learners have the opportunity to consolidate their knowledge in the complex clinical practice and especially in the operation theater. Using this new curriculum, we are able to offer students intensive hands-on traning in trauma surgery in a very cost-efficient manner and to motivate them in the field of trauma surgery.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1531 - POSTER BOARD # 60

Participants' 5-Month Outcomes After End-of-life Simulation Training Program

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INTRODUCTION: Many pediatric healthcare professionals report being ill-equipped for difficult end-of life discussions. The Program to Enhance Relational and Communication Skills (PERCS) provides experiential learning opportunities for clinicians to sharpen their skills and reinforce their confidence in handling difficult situations with patients and their families. The intensive program creates realistic experiences utilizing high-fidelity simulation with professional actors. Participants review their videotaped experiences with fellow professionals and the PERCS learning team of medical, psychosocial and parent staff.

METHODS: To evaluate the effectiveness of the PERCS program's immediate and 5-month outcomes, participants were given post-training and 5-month follow-up questionnaires. Post-training qualitative questions were:

What were the most helpful aspects of the training program? Please reflect on what you may have learned and what you found to be most important in the session today and on any part of your professional and/or personal learning. 5-month follow-up questions were: What do you remember learning in the PERCS program that has served you well in difficult discussions with patients and/or their families? Have you made any changes in your clinical practice or professional life as a result of the PERCS program?

Participants' responses were read and coded into six thematic categories: Reflection on Own Practice, Value of Training Experience, Value of Practice, Confidence/Recognition Own, Team and Communication /Relational Skills Learned.

RESULTS: One hundred and four trainees (mean age 34.0) including physicians (40%), nurses (43%), and psychosocial staff (17%), with varying degrees of experience, completed the post-training and 5-month follow-up questionnaires. PERCS participants reported gaining both immediate and long-term benefits. Most trainees reported that the aspects of the program they were most likely to remember and use in their clinical practice were those linked to specific communication and relational skills, for example, the ability to listen well, empathize, and better "communicate in an emotionally charged arena." After five months, participants reported significant retention of the knowledge they acquired in training and reported using this knowledge in clinical practice.

CONCLUSION: As a result of their training, participants reported immediate and long-term practical and clinical utility. PERCS trainees reported experiencing significant gains in communication and relational knowledge, specifically the acquisition of a strong skill set to draw upon in ongoing clinical situations and improved ability to handle difficult conversations involved in end-of-life care.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1532 - POSTER BOARD # 55

Simulating Abdominal Surgery Using Common Household Items

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INTRODUCTION: The University of Louisville School of Medicine added a section to the Introduction to Clinical Medicine course called Interdisciplinary Clinical Cases (ICCs). The bi-weekly ICC sessions are small group sessions proctored by a clinical faculty member in which clinical cases are discussed with first and second year students. Recently, a new simulator-based session was added to the second year ICC curriculum. This session provided students with the opportunity to participate in a simulated exploratory abdominal surgery. The specific clinical case was that of a patient whose small intestine was acutely obstructed by an internal hernia requiring exploratory laparotomy.

APPROACH: To provide this educational opportunity to students, simulated abdomens had to be designed and constructed, necessary supplies identified and obtained, and logistical issues worked out.

The simulated abdomens consisted of the abdominal cavity, organs and abdominal wall. The abdominal cavity was created using a plastic storage bin purchased at a discount store. Small intestines and mesentery were simulated using fabric and stuffing. The mesentery was sewn by hand to the base of the container. A small section of fabric with a small slit in the middle was attached to one corner of the bin to simulate the internal hernia. A knuckle of the "intestine" was pushed through the slit to represent the hernia. The bin was covered with an abdominal wall constructed of upholstery foam (fat) glued to fabric (skin) that was firmly tied down to the operating table. In order to provide the simulated abdominal surgery experience to 150 second year students, we conducted 8 simultaneous 1-hour surgeries, with 6 or 7 students per abdomen. We repeated the session three times to accommodate all ICC groups. After gowning, gloving, and draping, students used scalpels and retractors to enter the abdomens. After exploring the abdominal contents, they reduced the hernia, examined the bowel, attempted to suture the hernia defect, and lastly closed the abdominal incision. Between sessions, the knuckle of intestine had to be re-inserted into the hernia defect and all abdominal walls replaced. Surgical supplies such as suture, gowns, gloves, and instruments were also prepared for the next group.

CONCLUSION: This ICC session was a tremendous success. Students seemed genuinely engaged and excited, and their anecdotal comments were all positive. Upholstery foam and fabric simulated subcutaneous fat and skin fairly accurately, especially when incised with a scalpel. The girth and color of the small bowel could be altered as need to characterize almost any intra-abdominal pathology. Materials needed to create this surgical simulation exercise for all 150 students cost less than $300 total.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1535 - POSTER BOARD # 27

Development Of A Simulation Program To Teach Pediatric Resuscitation In An Emergency Medicine Residency Program

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INTRODUCTION: Pediatric resuscitation is unique in many aspects from adult resuscitation, including the extreme rarity of occurrence as well as a strong emotional involvement by staff. The pressure and acuity of real situations make it difficult for adequate teaching to occur, and mistakes can have devastating consequences. Standardized life support courses have been developed to provide training and establish a minimum competency, however they fall short in providing realistic scenarios and it is difficult to measure resident retention of information and techniques. Studies have shown that residents are receptive to simulator based learning and this may represent the future of medical education. There is little research in the area of teaching pediatric resuscitation via a simulated environment. As residency programs strive to educate residents in the safest, most efficient, and most realistic way possible, we provide a description of innovative techniques in pediatric simulation.

OBJECTIVE: To describe a new curriculum: Pediatric Emergency Simulation (Pedi-Sim) developed to teach the skills and knowledge presented in the standard American Heart Association Pediatric Advanced Life Support (PALS) course.

METHODS: Incoming interns in an emergency medicine residency program participated in a one day Pedi-Sim course instead of the standard PALS course. The first three hours focused on basic knowledge and skill development. The remainder of the day consisted of high-fidelity case simulations focusing on key learning objectives in pediatric resuscitation. One resident led and one resident assisted in each case simulation while the others observed via real-time video. All residents participated in a guided debriefing session with video playback. Residents rated their experience on a horizontal numerical scale survey (1 = worst rating to 5 = best rating).

RESULTS: Preliminary results show that the Pedi-Sim course was well-received by residents, with an overall rating of 4.9. The residents favorably rated Pedi-Sim in areas of critical thinking, development of behavioral skills, and the ability to transfer these skills to the real environment.

CONCLUSION: Interns participating in a Pedi-Sim course were enthusiastic about their experience. Knowledge assessment of key concepts via a traditional exam will be conducted. Perhaps a shift from traditional PALS to a simulation-based PALS for resident education in pediatric resuscitation may be warranted.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1536 - POSTER BOARD # 28

Blending a Standardized Family Member with High-Fidelity Patient Simulation: An Integrated Approach to Teaching Breaking Bad News

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Breaking bad news (BBN) compassionately is a vital skill that is expected of all physicians but it is generally not a focus of most training curricula. Our integrated approach to teaching BBN involves having the students break bad news to a standardized family member, immediately following active participation in an unsuccessful resuscitation on a high-fidelity human patient simulator.

Four standardized patients (SP) were trained to the resuscitation scenario used at the simulation center. One SP was trained to a fetal demise scenario that was used during a workshop in the classroom. Seventy-six third-year medical students were divided into two groups. All students completed a questionnaire prior to participation. Group 1 received little or no training prior to the resuscitation and breaking the bad news to the SP. Group 2 received a didactic lecture followed by small group sessions that allowed students to practice BBN. After the encounter, the students' completed a self-assessment of their ability to have a plan. They were also evaluated by the SP's using a likert scale on 21 items. Each group was debriefed by the clerkship director. Group1 received crossover training after their encounter.

Both groups were equal in terms of previous training and in the belief that the skill was important. Self-assessed ability to BBN and have a plan improved significantly over base line for both groups. Both rated the experience as extremely valuable and very realistic. The standardized patient wives' evaluation of the students showed significant improvement in key areas of effective BBN when compared to those that received little or no training. The students' experiences are being tracked longitudinally throughout the clerkship. This integrated approach was well received by the students and resulted in marked improvement of self-assessed skills and performance of students' ability to BBN.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1538 - POSTER BOARD # 29

Simulation-based Parent-guided Project to Improve Disclosure of Unanticipated Outcomes

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BACKGROUND: The Joint Commission for Accreditation of Hospitals and Organizations, the American Medical Association, and the National Patient Safety Foundation all encourage disclosure of unanticipated outcomes to patients. This recommendation provides a unique challenge in pediatric hospitals where disclosure most often involves the patient's family. In reviewing incidents at our hospital, we found that better communication is needed between caregivers and patients' families in instances of real or perceived error. We developed a high fidelity, hands-on, simulation-based training program utilizing parent advisors to assist staff in communicating errors with empathy in order to maintain trust and create a truly healing experience.

Our challenge was to design a training program that effectively imparts the cognitive, technical and behavioral skills necessary when discussing the following situations with patients and families: No error made, but harm occurs

Error made, no patient harm occurs Error made, patient harm occurs.

METHODS: Half day simulation-based training sessions were conducted for multidisciplinary teams from the oncology floor of a children's hospital. Teams of trainees consisting of a bedside nurse, charge nurse, physician, and social worker enter the simulator and interact with patients and families in one of three scenarios requiring disclosure of unanticipated outcomes. Members of a parent advisory council acted as parents in each scenario to provide a realistic experience for the trainees. Each scenario was videotaped and played back during debriefings facilitated by instructors experienced in simulation-based training and parent/actors.

RESULTS: Prior to training, each trainee completed an objective assessment of their content knowledge of medical disclosure and a subjective assessment of their skill in and comfort with discussion of error with families; assessments were repeated after program completion. Information regarding communication and trust is being collected retrospectively from parents of patients who experienced a medical error in the 6 months prior to initiation of training; surveys will be repeated 6 months after initiation of this program.

Results

Verisimilitude of the Simulation	
Room	3.6
Lighting	3.9
Acoustics	4.3
Mother role	4.8
Scenario Effectiveness	
How real	4.5
Verbal skills evoked	4.1
Nonverbal skills evoked	4.3
New skills used	4.6
Training Effectiveness	
Simulation	4.6
Mother	4.9
Debriefing	4.7
Overall	4.8

Disagree (0) to Agree (5)

FUTURE: This program can be tailored to meet the needs of all pediatric inpatient settings. We will design unit-specific scenarios to best meet the training needs of our multidisciplinary staff and implement this program hospital wide on an annual basis.

CONCLUSION: Given the lack of peer-reviewed literature on this topic, this program will define the standard for disclosure training by incorporating family members, multidisciplinary teams, and the use of simulation-based training to develop unit based SWAT teams for disclosure of unanticipated outcomes. This program can be tailored to meet the needs of all inpatient settings. Providing this training promotes trust between patients, their families, and healthcare professionals and acts to change the culture of blame currently present in medicine.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1539 - POSTER BOARD # 72

Controlled Crossover Trial of Surgical Interactive Multimedia Module (SIMM) on Knowledge, Clinical Reasoning and Satisfaction

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BACKGROUND/RATIONALE: Teaching in the surgical clerkship faces constraints as the breadth and depth of students' education is fragmented by changes in patient and physician exposure. These constraints drove the development of cutting edge multimedia education tools, as well as assessments to determine their impact on students' knowledge, clinical reasoning and satisfaction compared to the traditional clerkship curriculum.

WHAT WAS DONE: The Surgical Interactive Multimedia Modules (SIMMs) are online, self-directed modules based on clinical encounters with hypothetical patients. Developed according to the best educational theory, they use multimedia, including 2D and 3D animation, video, and text, to illustrate surgery in a dynamic and clear fashion, appropriately model physician behavior, and highlight important principles concisely. We undertook a controlled, cross over study to assess the impact of the Carotid Disease SIMM on students' knowledge, clinical reasoning and satisfaction. Half of students were assigned to complete the SIMM in the first half of the clerkship and the rest were given access to it in the second half. All Students completed tests of knowledge and clinical reasoning (Script Concordance Test [SCT]) at the beginning, midpoint and end of the clerkship, and the intervention group completed a survey of their experience with the SIMM at the end of the clerkship.

CONCLUSIONS: Early data based on four rotations of the surgery clerkship (n=93) show a trend toward improved knowledge (pre-post delta 28.38% intervention vs. 10.67% for control group p=0.2203, 95% CI -11.22,46.64). The data show an improvement in clinical reasoning for Symptomatic Carotid Disease (pre-post delta 32.5% vs. -3.13%, p=0.0521, 95% CI for the difference in deltas 2.06,69.19), the main content area of the SIMM, but not for related clinical areas (Recurring TIAS, Lower Extremity Disease, Asymptomatic Carotid Disease and Coronary Artery Disease). More than 80% of students felt the SIMM was superior to traditional teaching methods including lectures and surgery videos, and 81.8% strongly agreed that the SIMM enhanced their understanding of surgical technique and anatomy.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1540 - POSTER BOARD # 34

Resident Performance Assessment Measured by Task Completion during an Obstetric Anesthetic Scenario on a High Fidelity Human Patient Simulator

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INTRODUCTION: The ACGME has mandated that residency programs assess competency by developing tools that evaluate proficiency in specific areas. Although anesthesiologists must learn how to respond in emergencies, this competency is difficult to evaluate. Real emergencies are unusual and do not lend themselves to rigorous evaluation. The percentage of patients having Cesarean delivery under general anesthesia (GA) has decreased. In an effort to assess competency we have developed a scenario and a scoring system using a modified Delphi technique on a high fidelity human patient simulator of an emergency Cesarean delivery under GA. The purpose of this study was to compare the task completion rate between residents in their 1st and 3rd year of clinical anesthesia training.

METHODS: A list of tasks relevant to performing an emergency cesarean delivery under GA was determined by a panel of 6 obstetric anesthesiologists with widespread US geographical representation and practice settings (1). The tasks were divided into four primary components parts: preoperative assessment, anesthesia setup and preparation, induction and intubation, and operative management. Sixteen resident anesthesiologists of different levels of training (8 CA-3 residents with extensive obstetric anesthesia experience, and 8 CA-1 residents with little or no such experience) were videotaped performing the simulation. Four attending anesthesiologists viewed and scored each of the 16 videotapes. To achieve task completion two of the four reviewers had to document performance. Overall task completion rate as well as the completion rate for each of the four component domains was compared between resident training levels using a χ^2 statistic. A $P < 0.05$ was required to reject the null hypothesis.

RESULTS: The total number of observed tasks as well as those observed in each component of the simulation is shown in the table. CA-1 residents completed an average of 69 ± 6 percent of the 47 tasks compared to 79 ± 7 percent by the CA-3 residents. Individual tasks that demonstrated the greatest discrepancy between groups were airway evaluation (1/8 of the CA-1 group compared to 6/8 of the CA-3 group) and failure to reduce the inhalation anesthetic concentration following delivery (0/8 of the CA-1 group versus 8/8 of the CA-3 group).

DISCUSSION: This study demonstrates that residency performance of an emergency cesarean delivery can be assessed by examination of task completion rates. In addition, identifying areas of greatest discrepancies can be used to structure education in performing critically important tasks for during emergency situations.

		Level of Training		
Component	# of tasks	CA-1	CA-3	P
Preoperative assessment	7	23/56	39/56	0.002
Anesthesia set-up and preparation	16	87/128	95/128	0.27
Induction and intubation	13	86/104	96/104	0.04
Operative management	11	63/88	72/88	0.10
Overall	47	259/376	302/376	0.003

Data presented as number of observed tasks/total observable tasks.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1541 - POSTER BOARD # 35

Fidelity and Transfer of Training in Medical Simulation

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Simulations are commonly used in organizations as a means to train personnel in a cost-effective and safe manner. However, simulations differ in terms of the fidelity used to recreate the real world environment from PC-based to full motion flight simulators. Fidelity is one of the most widely used terms in the simulation literature; however, usage and meaning of the term vary greatly. Generally, fidelity can be conceptualized as the degree of similarity between the training situation and the operational situation that is being simulated. We know that simulator fidelity is a crucial element in maximizing the transfer of skills learned in the simulator to the operational context. One must ask, however, what type(s) of fidelity is needed and how much is needed for transfer of training to be effective?

The difficulty in understanding fidelity arises from the multiple ways of classifying differences between the simulation and the simulated, and identifying how these differences affect aspects of training. At least nine distinct classifications of fidelity exist (i.e. functional, physical, psychological, experiential, action, equipment, environmental, objective and perceptual) all with different implications for the effective use of simulation in training programs. For example, an early mindset within the aviation simulation community took as an axiom that the highest levels of all types of fidelity would produce the best transfer of skill; however, empirical results challenged this stance. Rather, it has been found that the appropriate type and amount of simulator fidelity varies based on variables such as the nature of the task, the sophistication of the trainee, the training context, the stage of training, and the specific motor, perceptual, cognitive and other skills required by the task. The discussion and systematic research of the effects of simulator fidelity on transfer of training in the medical domain is beginning to emerge and can benefit from the accumulated knowledge of simulation usage in the aviation domain.

To that end, the purpose of this poster is threefold: (1) to review the disparate conceptualizations of simulator fidelity, (2) to review the variables that interact with fidelity to impact training effectiveness in the aviation domain and postulate analogous relationships in the medical domain, and (3) to provide lessons learned from the aviation community in regards to the optimal use of simulator fidelity. The results of this analysis are relevant to the design and operation of medical training facilities as a robust understanding of the impact of simulator fidelity on training effectiveness is essential to optimizing training resources.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1542 - POSTER BOARD # 91

A Simple And Yet Revolutional Solution For Minimally Invasive Skills Training

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AIMS: For more than a decade box trainers are regarded as the basic tool for laparoscopic skills training; however, based on real operating room systems, these are very expensive and require dedicated centers and expertise to utilize. The aim of this study is to evaluate a new and relatively cheep box trainer relying on contemporary visualization and computer connectivity technologies.

METHODS: 32 participants with varying levels of skill in minimally invasive surgery (MIS) took part in this study. The box trainer used was the LapTrainer with Simu Vision TM (Simulab, USA), utilizing a simple plastic box, a web cam and a USB 2.0 card. Laparoscopic instruments comprised of standard OR tools. Following a short warm up session, participants were required to perform three tasks of increasing level of complexity (rope passing, peg transfer and intracorporeal knot tying). All tasks were video recorded and blindly assessed by two experts using error scores, performance checklists and time to completion. Statistical analysis included non parametric tests and Cronbach's alpha for inter rater reliability. A $p < 0.05$ was considered significant.

RESULTS: Highly significant differences were noted between the four study groups (novices, junior trainees, senior trainees and experts) in all tasks and for all parameters (Kruskal Walis, $p=0.001$). Inter rater reliability (IRR) was as high as 0.88 (range 0.83–0.98) for all tasks assessed. 90% of the participants have rated the simulator as good or very good (80–100%) by means of a five point Lickert scale questionnaire.

CONCLUSIONS: The Simulab LapTrainer provides a valid alternative for skills training. Furthermore, its simplicity and relatively low price (5% of conventional video trainers) makes it a worthy and yet an inexpensive training system for most surgical departments thus, allowing in-house on going skills training.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1543 - POSTER BOARD # 37

Using Simulation To Promote Staff Education About Parent Presence At The Bedside During Invasive Procedures And Resuscitation

Liana J Kappus,[1] Bethany Trainor,[1] Martha A.Q. Curley,[1] Robert Pascucci,[1,2] Susan Hamilton-Bruno,[1] Aimee Lyons,[1] Patricia Hickey,[1] Elaine C. Meyer[1,2]; [1]Children's Hospital Boston, Boston, MA, [2]Harvard Medical School, Boston, MA

INTRODUCTION: The literature suggests that parents desire a choice regarding their presence during their child's procedures and resuscitation. Parent presence during procedures has been associated with improved parental adjustment and coping. Although parent presence during procedures is becoming increasingly prevalent in pediatric hospitals, there remains significant controversy and staff anxiety. Despite the trend toward greater parent involvement, there is a paucity of training opportunities to prepare clinicians. To address this deficiency, we used simulator technology to create educational videos demonstrating a hospital guideline, good communication, and role of the parent facilitator.

METHODS: An interdisciplinary committee comprised of critical care physicians, nurses, and psychosocial staff collaborated to develop a hospital practice guideline for the cardiovascular and critical care programs regarding parent presence during procedures and resuscitation. A curriculum for critical care nurses was designed in three phases. Phase 1 included individualized in-services introducing the guideline and its components to nursing staff. Phase 2 provided in-depth review of the guideline and role of parent facilitator to leadership level nurses. Both Phases 1 and 2 incorporated video-taped simulated clinical scenarios using actors and patient simulators. Phase 3, which is currently in planning, will provide experiential learning opportunities using simulation for those that will serve as parent facilitators.

RESULTS: Phase 1 of the curriculum was completed in three months. Illustrative video clips were included in the in-service presentation to highlight particular aspects of the guidelines including: gaining consensus among the team for a parent to be present for an invasive procedure or resuscitation; assessing the parents' preference to be present; and how to provide parents with the education and support needed to enable them to be a source of comfort to their infant/child during a procedure. Phase 2 was presented to all leadership level nurses during their annual retreat and included clips portraying: making the decision to acquire a parent facilitator to provide patients with a familiar source of support during a procedure; introducing the facilitator to the parent to show continuity of care and foster trust; and the importance of meeting with the parent after a procedure to ensure that all questions were answered. Several clips showcased the specific role of the facilitator: to be a constant presence for the family; allowing for silence; using touch; containing the anxiety and affect of the situation; gauging the amount of information that the parent wants to and is able to hear; and seeking more resources including psychosocial staff when the limits of the parents' tolerance had been reached.

CONCLUSION: We used simulation in a novel way to train a large population of nursing staff in a short period of time on a guideline surrounding parent presence during procedures and resuscitation. The presentations provided a framework to prepare nurses for parents' presence at the bedside during high-risk situations; videotaped simulations illustrated an approach toward achieving those objectives. We plan, in Phase 3, to directly engage chosen facilitators in high-fidelity simulation with parent actors to afford them opportunities to practice the components of the guidelines.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1544 - POSTER BOARD # 73

The Effects of Simulation Use and Prior Experience on Trainee Knowledge Structure and Task Performance in Cardiopulmonary Emergency Medicine Training

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This presentation reports findings of an ongoing research effort examining the role of prior training and work experience on changes in the knowledge structure of EMTs and Paramedics engaging in high fidelity simulation training on a variety of cardiopulmonary emergency medicine tasks (e.g. acute myocardial infarction, chest pain assessment, congestive heart failure, pulmonary edema). Differences between experts' and novices' domain specific knowledge structures have been well documented in the training literature and these structural differences have been linked to the ability of individuals and team members to perform complex tasks effectively. A critical feature of expertise and expert performance lies not just in the amount and type of information that a person holds, but in the organization of that knowledge and linkages between concepts representing the domain of expertise. Knowledge elicitation is a measurement technique designed to tap the conceptual organization of domain specific knowledge, and in this case, was used as 'high-resolution' instrument to asses learning outcomes of EMTs and Paramedics engaged in training on high fidelity mannequin patient simulators (i.e. SimMan© and SimBaby©).

The knowledge elicitation technique used in this study involved the collection of relatedness judgments from the trainees of concepts covered in the training program. The trainees completed a set of judgments immediately before and immediately after training sessions. These results were then compared to expert knowledge structures of the task domains (e.g. an "average" structure derived from knowledge elicitation administered to trainers). Mathematically, two measures of knowledge structure were calculated: (1) a measure of similarity between the trainees' knowledge structure and the expert structure, and (2) the internal coherence of each trainee's knowledge structure independent of comparison to the expert. In this way, the impact of specific aspects of the training and simulation characteristics could be assessed in terms of both objective task performance and alteration of the trainees' conceptual organization. Changes in the pre-training and post-training knowledge structures were then analyzed with respect to objective performance measures on the task as well as in relation to past training/work experience. The results of this research effort will contribute to the understanding of how simulation can be used to build expertise in emergency medicine practitioners as well as exploring the utility of knowledge elicitation as measurement technique for the purposes of diagnosis, remediation, and outcome assessment in medical training programs involving high fidelity simulation.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1545 - POSTER BOARD # 68

Evaluation Of A Mobile 'In-Situ' Simulation Training Course For Teams (Paramedics And Doctors) In Wing-Based Emergency Air Rescue And Intensive Care Transport Using Subjective Pre-Post Competency Rati.

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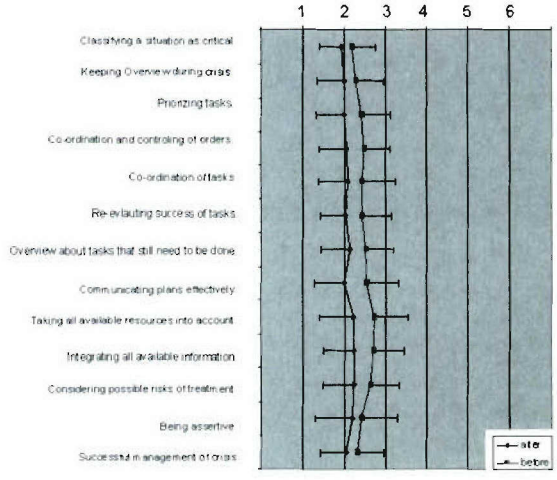
BACKGROUND: Mobile "in-situ" simulation training could add a new dimension to the benefits of realistic scenarios. "In-situ" means that the training takes place in the real work place; the simulator instead of a patient. Especially in unusual clinical work places this form of training seems worth the extra effort of setting up the whole simulator and video-debriefing equipment. The teams of the German Air Rescue (DRF) studied here are mainly very experienced clinicians (paramedics and MDs). We evaluated our mobile in-situ trainings for the wing-based emergency service using subjective pre-post training competency ratings..

METHOD: The trainings were performed according to the "train where you work" principle in the Learjets of the DRF. The simulator (SimMan, Laerdal) and several video cameras and microphones were set up inside the jets including some heavy speakers for replaying the engine noises (90dB). A live transmission of a quad split view including vital signs was projected outside for the non-active trainees. 6 full day CRM-courses are evaluated with 66 participants altogether. After the course a questionnaire had to be filled in. Using a 6 point scale several competencies had to be rated a) judging your competency before the course (pre) and after the course (post, now). A paired t-test was used to judge significance.



RESULTS: As shown in Figure 1 there is a trend to subjective improvement for all competencies. Especially for the competencies related to crisis resource management a slightly bigger improvement is demonstrated (Communicating plans effectively, Taking all available resources and information into account). Unfortunately the differences did not reach statistical significance, although for some competencies this was very close (p=0,065–0,09). In addition, during the in-situ trainings many problems of routine work (where is what etc) are discovered and can be solved

CONCLUSION: It is amazing to see that even very experienced teams do profit from the in-situ trainings. But also the provider DRF gets important information about how to improve their services. Although the logistical expenses should not be underestimated, for us, the in-situ trainings are the first choice and the peak of training for all unusual fields of care (emergency helicopter, ambulance, cath lab, CT scan etc) and experienced teams.

DISCLOSURE:

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Honoraria	LaerdalMedical
Lecturer/Speaker	LaerdalMedical

ABSTRACT # 1547 - POSTER BOARD # 16

The Harvard Summer PreMedical Institute: Fostering Biomedical Literacy through Patient Simulation

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Advanced biomedical science and technology are poised to fundamentally alter the human condition. Yet, because few high school or college students experience the true excitement of the field before choosing a career path, the available pool of professional intellectual capital is inherently limited.

PURPOSE: To introduce high school and college students to the "practice" of medicine using a high-fidelity patient simulator. We hypothesized that advanced instruction in basic and clinical science—typically unavailable to such students—could be intellectually transformative.

METHODS: A group of educators at Harvard Medical School worked to design an intensive simulator-based curriculum for pre-medical students (one week for college students; the following week for high-school students). Classes were based at the Gilbert Simulation Labs on the medical school campus, each of which is outfitted with a full-body patient simulator, basic medical equipment, a conference table, and a web-based plasma screen. Students were selected from local schools based on institutional recommendations. The curriculum centered on seminal medical cases that served to animate the role of basic and clinical biomedical science in modern health care (chest pain, shortness of breath, abdominal pain, trauma, altered mental status). After an initial introduction to core medical concepts, the students were taught—and subsequently expected—to manage increasingly complex clinical cases (typically in teams of 5). All students were asked to provide a written evaluation of the course, and to keep a journal of their reflections.

RESULTS: During 2 weeks in the summer of 2005, 11 college and 11 high-school students participated in the program. By the end of the course, both high-school and college students were able to take a standard history, perform a basic physical exam (including vital signs and cardiopulmonary auscultation), formulate a differential diagnosis, and evaluate various confirmatory tests (including chest x-rays, heart tracings, and basic labs). They learned the role of basic science in everyday clinical care, and came to understand the critical importance of effective communication with patients and colleagues. On the evaluation survey, 100% of the college students rated the course as "excellent" (highest on a 5-point scale), as did 78% of the high-school students (n=9 respondents). Of all students, 90% felt the experience was "much better" than prior educational experiences. Comments were overwhelmingly positive, including: "What started as simply 'class' transformed into the most enlightening week of my life"; "[it] was as though the lights have been turned on in a previously dark room"; "one of the best educational experiences I have ever had."

CONCLUSIONS: Biomedical science can be effectively animated for high-school and college students through patient simulation. Such an approach can foster intense interest in the life sciences at a formative age.

ACKNOWLEDGEMENTS: This program was funded by a grant from the Harvard University Office of the Provost. Special thanks to: the HMS Office of Diversity and Community Partnerships for helping to select candidates; Wally Bethune, Angela Counts, and Rosemarie Meuse for their logistical support; and the BIDMC simulation lab for providing instruction in surgical technique.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1548 - POSTER BOARD # 38

Integration of High-Fidelity Patient Simulation into a Traditional Pediatric Critical Care Curriculum: Trainees Perspective

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INTRODUCTION: According to adult learning theory, active involvement and reflection are of utmost importance for the transference of knowledge and skill. Unfortunately, opportunities for pediatric residents to gain experience with independent clinical decision-making are waning due to work hour restrictions, patient safety, and emerging expectations for attending-level care only. To provide greater hands-on experience for pediatric residents at our teaching hospital, we conducted a pilot study incorporating simulation-based teaching into a traditional pediatric critical care lecture curriculum.

METHODS: A traditional lecture-based curriculum was adapted to include high-fidelity simulation. Seven modules, spanning two days each, were designed as a lecture complimented by an illustrative scenario. Teaching goals of each module included all aspects of patient care, from pathophysiology and history/physical taking to interpretation of tests and diagnoses. Over a 9-month period 37 pediatric trainees (PL2 and PL3) participated in beta-testing of the Airway Module. Day 1 was a 45-minute lecture covering respiratory support, airway equipment and induction/intubation regimens followed by (day 2) a simulation centered on the care of a 7-year-old child with a football injury resulting in respiratory distress complicated by elevated intracranial pressure. Objectives included identification of hypoxemia and respiratory failure, ability to select and use appropriate oxygen delivery systems, demonstration of proficiency with bag-and-mask ventilation, and eventual intubation using appropriate medications for a patient with increased ICP. In contrast to typical crisis-management training, sessions were specifically designed to move slowly, allowing trainees time to think and try different approaches to the clinical problem. To evaluate trainee experience, a post-questionnaire was administered which included Likert as well as two open-ended questions: • What did you enjoy about or gain from the training session? • Please reflect on what you may have learned and what you found to be most important in the training program.

RESULTS: Qualitative analysis was conducted by two independent raters to identify the most important aspects of the training as viewed by the trainees themselves. Trainees identified these as: 1) having opportunity to practice with equipment; 2) a slow pace allowing for group discussion; 3) ability to make decisions without outside assistance; and 4) use of a "clinical pause" to ensure global understanding.

CONCLUSIONS: This pilot study demonstrates that hands-on learning in a simulator suite, following a traditional didactic session, enhanced trainees learning experience by providing an environment for active learning and reflection on the material. Trainees reported that (1) it was more important for them to have hands-on practice with basic airway equipment than to practice higher level thinking surrounding respiratory mechanics, (2) they enjoyed the slow pace of the simulator session, cooperatively making decisions with the results demonstrated in real-time, and (3) they enjoyed the "clinical pause" in the simulator session, which encouraged reflection and provided time to achieve understanding on the part of all participants. As a result of this pilot study, we plan to continue to incorporate simulation into the traditional curriculum. Future studies will compare traditional lecture based teaching with the simulation-enhanced curriculum.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1549 - POSTER BOARD # 36

Evaluation of Behavior in the Delivery Room: Validation of a Scoring Tool

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BACKGROUND: Communication failures are the leading cause of inadvertent patient harm. The traditional Neonatal Resuscitation Program course is heavily weighted in cognitive and technical skill acquisition but ignores the behavioral skills necessary successfully manage neonatal emergencies. By evaluating these behavioral skills, it becomes possible to identify areas of weakness and strength. This information can be used to target training towards an individual's deficits. In order to evaluate these skills in simulated or real-time video performance, a valid and reliable tool is necessary.

METHODS: 18 members of a resuscitation team reviewed two videos of simulated neonatal resuscitations in the delivery room. The personnel in each video were not familiar to any of the members of the resuscitation team. Performance of the lead physician was scored using a Likert Scale based instrument "Evaluation of Behavior in the Delivery Room"(EBDR). EBDR was created by experts in neonatal resuscitation and simulation-based training and is based on ten behavioral principles necessary for effective crisis management derived from the tenets of Crew Resource Management (CRM). Data from the rating was analyzed using SPSS (Statistical Package for Social Sciences; SPSS, Chicago, IL, USA).

RESULTS: Content validity ratios describing the completeness of the tool all equal 1 (>0.99 is considered valid). The accuracy between reference rater and rater scores for video one was 90.8% and for video 2 was 93.8%. The internal consistency as measured by Cronbach's alpha was 0.8331 for video 1 and 0.9168 for video 2.

CONCLUSION: The content validity, accuracy, and internal consistency of the EBDR were very high. The IRR was also acceptable at > than 0.6. The EBDR is a tool that effectively scores behavioral skills in the delivery room during neonatal resuscitation. This tool, with further refinement, has the potential to improve the effectiveness of training by targeting the teaching to an individual's need, thereby, improving the behavioral skills of the practitioner and ultimately leading to increased patient safety.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

Results

Behavioral Skill	Rwg Video 1	Rwg Video 2
Knowledge of the environment	0.7124	0.6780
Anticipating potential problems	0.8823	0.6977
Assuming a leadership role	0.5163	0.5212
Communicating effectively	0.7516	0.5167
Delegating, distributing workload	0.6144	0.6732
Focusing attention wisely	0.6470	0.5147
Using all available information	0.7908	0.7647
Using all available resources	0.5147	0.7647
Calling for help early enough	0.8105	0.4820
Maintains a professional demeanor	0.4967	0.7500

Rwg=1-(S 2/ E2)

ABSTRACT # 1550 - POSTER BOARD # 84

Development of a Transportable Modular Simulation-Based Patient Safety Curriculum for Graduate Medical Education

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BACKGROUND: Graduate medical education (GME) has traditionally placed limited attention on human factors training to promote patient safety. Human error has long been recognized as a significant component of error in both aviation and medicine. Despite this knowledge and national patient safety momentum most residency programs have not changed significantly, with the exception of the mandatory work hour restriction.

OBJECTIVES: 1) To create an introductory transportable simulation-based curriculum for resident education in human factors and patient safety. 2) To identify GME competency domains amenable to simulation-based assessment for multiple specialties. 3) To produce a simulation reference to assist the medical simulation community expand patient safety education.

METHODS: This one year demonstration program funded by Centers for Medicare and Medicaid Services (CMS) was conducted at a regional simulation center and large tertiary care hospital. The modular curriculum design is flexible to allow for a broad patient safety education or focused intervention as determined by training priorities. Also, all modules have been linked to required ACGME competency requirements. A core characteristic of the project curriculum is its portability, which will permit medical educators to rapidly deploy its contents.

CONCLUSIONS: GME Education can incorporate patient safety and ACGME competencies into clinically relevant simulation scenarios. . Medical education should incorporate human factors training to foster cultural change and assist healthcare systems to become high reliability organizations.

Selected Simulation Modules

Clinical content	Patient Safety Focus	Suggested ACGME competency	Selected Target Residents
Difficult airway	Cognitive errors	Practice-based learning + improvement	EM, IM, PEDs
High acuity trauma resuscitation	Teamwork	Systems-based practice	EM, Surg
Medication error with adverse outcome	Authority Gradient/ Cultural change	Interpersonal + communication skills	ALL
Catastrophic patient deterioration in CT scan	Transitions in care	Systems-based practice	RADS, EM, IM

EM=Emergency Medicine, IM=Internal Medicine, PEDS=Pediatrics, RADS=Radiology Surg=General Surgery

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1551 - POSTER BOARD # 69

Performance of Crucial Resuscitation Maneuvers during Simulated Pediatric Cardiopulmonary Arrests: The Effect of an Educational Intervention

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BACKGROUND: Outcomes from in-hospital pediatric cardiopulmonary arrest remain bleak with only ~ 24% of children surviving to one-year post-arrest. Timely initiation of basic and advanced life support is crucial to improving survival. Several studies have shown that pediatric residents feel uncomfortable in managing cardiopulmonary arrests, however there are few studies objectively assessing resident resuscitation skills.

OBJECTIVE: 1) Document the proportion of pediatric residents that successfully defibrillate a human patient simulator within 3 minutes of simulated pulseless ventricular tachycardia (VT). 2) Compare the proportion that do so pre and post-educational intervention.

METHODS: Prospective, before and after educational intervention study. In 2004, pediatric residents participated in individual mock codes at a tertiary care university using a high fidelity simulator. Each mock code included a standardized scenario of a conscious patient progressing to pulseless VT. Time to initiation of chest compressions, to the first defibrillation, and the proportion of residents successfully performing these maneuvers was evaluated. Following the 2004 sessions, deficiencies in resuscitation skills were identified. Monthly teaching sessions focused on leadership skills and timely initiation of ventilation, chest compressions and defibrillation were initiated. In 2005, the mock codes were repeated and the performance of the residents was compared pre and post educational intervention.

RESULTS: In 2004, 72/80 (90%) and in 2005, 60/80 (75%) of pediatric residents participated in these individual mock codes. Level of training was similarly distributed each year. In 2004, 21/72 of pediatric residents failed to initiate or direct a nurse to initiate compressions on the "pulseless patient" during the entire 15 minute scenario vs. 4/60 in 2005, (29% vs. 7%; $p = 0.002$). Of the 21 residents who never did compressions in 2004, 14/21 (67%) recognized the patient was pulseless but eventually defibrillated, 6/21 (28%) defibrillated prior to checking a pulse and 1/21 (5%) never checked a pulse, started compressions or defibrillated. The mean time [+/- standard error] elapsed between onset of pulseless VT and initiation of compressions (substituting 15 minutes for those that never initiated compressions) decreased significantly: (2004: 363 [+/- 45 seconds] vs. 2005: 154 [+/- 30 seconds], $p < 0.001$). More residents failed to defibrillate the mannequin within 3 minutes of pulseless VT the first year, (2004: 35/72 (49%) failed vs. 2005: 23/60 (38%); $p = 0.17$). In addition, more residents were never able to able to successfully defibrillate the mannequin the first year, (2004: 4/72 (6%) failed vs. 2005: 0/60 (0%); $p = 0.06$). The mean time elapsed until successful defibrillation of VT in 2004 was 267 [+/- 25 seconds] vs. 2005: 186 [+/- 14], $p = 0.006$.

CONCLUSION: At our institution, individual annual competency assessments were initiated in 2004. These mock codes revealed alarming deficiencies in resident resuscitation skills. Implementation of an educational intervention focused on identified deficiencies was associated with a higher likelihood of successfully performing crucial resuscitation maneuvers. Further research to determine whether improved ability to deliver high quality basic and advanced life support in a simulated setting translates to improved patient outcomes is warranted.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1552 - POSTER BOARD # 56

Code Orange Simulator - Innovation in Emergency Preparedness Training for Health-care Providers

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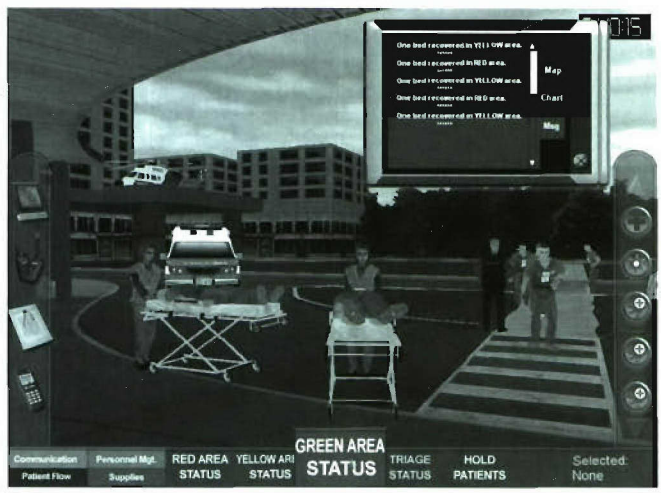
The Code Orange simulation is based within an Urban Hospital and presents the trainees with myriad crises there.

The ranges of crises are everything from transit accidents, school shootings, hostage situations, chemical-biological attacks, to a major terrorist attack. The trainees are physicians, nurses, security, and hospital administrators who are required to practice their disaster management skill sets during a virtual crisis before they have to react in an actual MCI.

GRAPHIC LOOK: The simulation has a three-quarters top-down view which allows the player to see the environment from multiple angles. The trainees control their character and through the character avatar interacts with other people and the environment.

TRAINING: The simulation requires the trainee to do the tasks that they would do during a crisis situation, e.g., evaluating the injuries of arriving patients, ordering tests, calling for a specialist, admitting a patient, and decontaminating a person or location. The player has to balance the needs of patients while projecting ahead to prepare for the scope and nature of the crisis. Players have to interact with the patients, the environment, and their co-workers in the simulation scenarios just as they would in an actual MCI. In addition, these scenarios are randomized as to the scope, magnitude, and timing of the MCI so that each time the trainee is presented with a specific crisis he must be prepared to be flexible in how he interacts with it.

NUMBER OF PLAYERS: The simulation is multi-player capable and playable over the Internet. The simulation is playable stand-alone with results saved to a file for later input to the system. Many trainees are able to play the simulation across a local area network and over the Internet; interacting with each other and with AI controlled characters.



TIME: Simulations is between 45 minutes and 1.5 hours. The time scale is adjustable to represent real-time at the slowest speed and 1/8 time at the fastest speed. This allows scenarios of up to 12 hours of simulation time which correspond to a max hospital shift.

SCORING SYSTEM: At the end of each scenario trainees are graded on their performance according to how efficiently they adhered to the proper protocols. Virtually every action the trainee performs in the simulation results in some positive or negative change to his points score. The score is used only to measure the level of the trainee's success, relative to his standing vis a vis other trainees or himself. The protocols and scoring system are based on the work of subject matter experts in order to provide as objective and realistic a scoring system as possible. The scoring system interfaces with a Learning Management System (LMS) which allows follow-ups of the trainees' level as well as institutions and regional level of competency. An additional benefit of a seamless LMS is the ability of policy makers in the field of MCI management to evaluate gaps in their plan and based on gap analysis to improve their institution preparedness.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

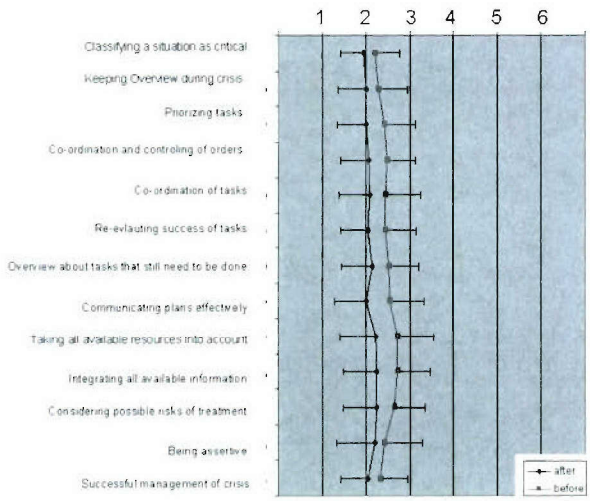
ABSTRACT # 1553 - POSTER BOARD # 44

Evaluation Of A Mobile "In-Situ" Simulation Training Course For Teams (Paramedics And Doctors) In Wing-Based Emergency Air Rescue And Intensive Care Using Subjective Pre-Post Competency Ratings

Marcus Rall,[1] Silke Reddersen,[1] Eric Stricker,[1] Joerg Zieger,[1] Peter Dieckmann,[1] Gerson Conrad[2]; [1]Center for Patient Safety and Simulation (TuPASS), Department of Anaesthesiology and Intensive Care, University Hospital Tuebingen, Tuebingen, Germany, [2]German Air Rescue, Filderstadt, Germany

BACKGROUND: Mobile "in-situ" simulation training could add a new dimension to the benefits of realistic scenarios. "In-situ" means that the training takes place in the real work place; the simulator instead of a patient. Especially in unusual clinical work places this form of training seems worth the extra effort of setting up the whole simulator and video-debriefing equipment. The teams of the German Air Rescue (DRF) studied here are mainly very experienced clinicians (paramedics and MDs). We evaluated our mobile in-situ trainings for the wing-based emergency service using subjective pre-post training competency ratings.

METHOD: The trainings were performed according to the "train where you work" principle in the Learjets of the DRF. The simulator (SimMan, Laerdal) and several video cameras and microphones were set up inside the jets including some heavy speakers for replaying the engine noises (90dB). A live transmission of a quad split view including vital signs was projected outside for the non-active trainees. 6 full day CRM-courses are evaluated with 66 participants altogether. After the course a questionnaire had to be filled in. Using a 6 point scale several competencies had to be rated a) judging your competency before the course (pre) and after the course (post, now). A paired t-test was used to judge significance.



RESULTS: As shown in Figure 1 there is a trend to subjective improvement for all competencies. Especially for the competencies related to crisis resource management a slightly bigger improvement is demonstrated (Communicating plans effectively, Taking all available resources and information into account). Unfortunately the differences did not reach statistical significance, although for some competencies this was very close (p=0,065–0,09). In addition, during the in-situ trainings many problems of routine work (where is what etc) are discovered and can be solved

CONCLUSION: It is amazing to see that even very experienced teams do profit from the in-situ trainings. But also the provider DRF gets important information about how to improve their services. Although the logistical expenses should not be underestimated, for us, the in-situ trainings are the first choice and the peak of training for all unusual fields of care (emergency helicopter, ambulance, cath lab, CT scan etc) and experienced teams.

DISCLOSURE:

Affiliation/Financial Interest	*Name of Proprietary Entity*(ies)
Lecturer/Speaker	SimuLearn Bologna, All Laerdal, Germany and Norway All

ABSTRACT # 1555 - POSTER BOARD # 49

Optimizing Learning: Implications of Psychology for Simulation-Based Education

Vicki R. LeBlanc,[1,2] Georges Savoldelli,[1,2] Stanley J. Hamstra[3]; [1]Wilson Centre, University of Toronto, [2]Patient Simulation Centre, St. Michael's Hospital, [3]Department of Medical Education, University of Michigan

INTRODUCTION: During the clinical years of training, educators are often faced with the puzzling challenge that their trainees seem to have forgotten what they have learned in their pre-clinical years. Simulation-based educators also face the same challenge, in that the knowledge and skills learned during simulation-based sessions appear to decay over relatively short periods of time. The goal of this poster presentation is to introduce participants to basic principles of psychology that can optimize the retention and transfer of simulation-based learning to the clinical setting.

SPECIFIC OBJECTIVES: Our poster presentation will outline how various psychological principles can provide answers to the following common questions from educators:

1. Why do trainees fail to recognize signs or problems that are seemingly obvious? 2. Why do the trainees forget information that they learned such a short while before?

3. Why do the trainees fail to recognize that a new problem requires the same solution as one seen such a short while before?

MATERIALS AND METHODS: In our poster, we will demonstrate how the manner in which information is presented to the trainees, how that information is linked to the trainees' prior knowledge, and how that information is practiced, will all have a significant impact of the trainees' learning and transfer of that learning to the clinical setting. Visitors to the poster will be taken through brief interactive examples to demonstrate the importance of the psychology principles. Furthermore, the poster presentation will outline simple means by which the discussed principles can be applied during simulation-based instruction.

IMPLICATIONS: Visitors to the poster will gain a better understanding of basic psychological principles and their application to simulation based education. This should influence their teaching styles and education methods, as well as influence how they develop their simulation-based curriculum. As a result, the application of the psychological principles covered in this poster may result in the optimization of simulation-based learning and transfer to the clinical setting.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1556 - POSTER BOARD # 45

Curriculum Innovation: The Three Pillars

Paula Burns, Bill Brennan, Susan Dunington; The Michener Institute for Applied Health Sciences

The Michener Institute is Canada's only postsecondary institution dedicated exclusively to education for the applied health science professions. Michener's academic innovation strategy is focused on competency-based curriculum design, and leading edge education ensuring *Best Experience Best Education* for every learner. The compelling reasons for the redesign of health care education include: (1) concerns that the present medical education model is not sufficiently preparing graduates to ensure safe and effective practice, (2) potential compromise to the long-term ability of medical education delivery because of a limited number of clinical education sites, and (3) evidence that highlights the need for rigor in the assessment of competencies for health professions.

The Michener Institute has taken a unique approach to address the challenges in medical education. The Academic Innovation Strategy is supported by 3 pillars which include Interprofessional Education (IPE), simulation education, and competency assessment, including assessment of readiness for clinical education.

IPE is defined as "occasions when two or more professions learn together with the object of cultivating collaborative practice" (Barr, Freeth, Hammick, Koppel, & Reeves, 2000). New curriculum was developed to ensure graduate competency in interprofessionalism. Micheners' organizational structure, use of physical resources and organizational communication patterns were redesigned to emulate the foundation principles of IPE.

Simulation education provides a safe environment for learners to hone skills in communication critical thinking, crisis management, in addition to the profession-specific technical skills. Simulation provides learners with life situations where there is immediate feedback about decisions and actions in an environment tolerant of errors. By building on established simulation education expertise, Michener was able to reduce dependency on external clinical education sites.

Developing authentic assessment of clinical education preparedness is not well documented. Our strategy is to develop authentic assessment to ensure that learners are prepared for clinical practice. Authentic assessment requires real-world application of skills and knowledge that have meaning beyond the assessment activity (Archbald & Newmann, 1988).

Several important issues are raised and discussed in relation to the academic innovation strategy. What does an authentic assessment for readiness for clinical include? How much time is required for students to reach clinical competency? How does the curriculum design process support academic innovation? What are the research opportunities?

This poster will highlight the rationale for the innovative strategy introduced by Michener, describe the strategic plan and illustrate the leading-edge curriculum design that integrates IPE, simulation education and a readiness for clinical assessment

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1558 - POSTER BOARD # 46

Simulator Teaching for A level school students with a career interest in Medicine

Georgina A Martin, Girish dhond, Janet Wyner, Kevin Russell, Mervyn Maze; Simulation Centre, Chelsea & Westminster Hospital, London, UK

INTRODUCTION: This course was first designed by the Simulation centre at the Chelsea & Westminster Hospital in London, which gives the candidates a real insight into what being a doctor is all about. The course incorporates the simulation, resuscitation and clinical skills team as part of the faculty involving the expertise of Consultant Anaesthetists, resuscitation officers, ODP's and clinical skills nurses. The candidates are A level school students (aged 16 – 18 years old) with an interest in becoming a doctor and this course was designed to not only gives them an insight into what medicine is all about but also the opportunity to learn skills which they can take on to their future training in medicine.

The Course: 2 day course 1st day – Skills stations

1. Basic/Advanced Life Support training 2. Defibrillation training

3. Airway and Ventilation Training 4. Cannulation and venepuncture training

5. Drug administration and training – best practice 6. Lecture and Practice – How to take a patient history

2nd Day - complete Simulation based training. The students have to put into practice the skills which they learn the day before. Before each scenario the students get a lecture on some medical condition which is then being simulated and after the scenario they are then debriefed on their performance which includes some non-technical skills. The scenarios which the students under take are from basic airway management, trauma to cardiac arrests.

Finally the students receive an extremely informative lecture on tips for medical school interviews and are given a booklet on that topic.

CONCLUSION: Feedback form the course reveals the students feel that they have been given a real insight into what medicine is about and they feel that the teaching mode of simulation is excellent. The students feel that the course has reinforced their desire to be a doctor. They also feel that it prepared them for the medical school interviews and the skills and knowledge that they have learned will benefit them greatly in their future career.

The instructors feel that via the simulator-based learning they were able to compact a large amount of information to novices in a short time frame, while at the same time giving the students a flavour of life as a doctor.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1560 - POSTER BOARD # 99

A Novel Debriefing Tool: Online facilitator guidance package for debriefing team training using simulation

Michael DeVita,[1,2] John Lutz,[1] Nicolette Mininni,[1,2] Wendy Grbach[2]; [1]Winter Institute for Simulation Education and Research, University of Pittsburgh, [2]UPMC Health System

Crisis team training (also referred to a crisis resource management) focuses on helping ad hoc teams function together to attain group goals. Our program focuses on predetermined roles and role appropriate tasks, coupled with an objective set of performance measures within time limits. Consistency and quality of debriefing within a course is a difficult task when facilitators have to be experts in both debriefing techniques and the model of care. The need for highly trained, expert facilitators limits the ability to mass train. Creation of tools that enable a lower level trainer who can deliver the same quality of training would benefit quality, reliability, reproducibility and throughput of training centers.

To overcome this hurdle, we have developed a web-based, interactive facilitator website that includes:

1) a checklist of open ended debriefing questions to prompt instructors while debriefing students;

2) navigation tools (to "toggle" between videos, scoring sheets, performance graphs, citations, and the teaching slide set);

3) a library of "teaching points" which focus on the goal of each debriefing; and

4) a library of simulations with errors and appropriate behaviors highlighted to teach facilitators what to look for.

Our tool utilizes a checklist approach that allows competent (not expert) instructors to provide expert (not competent) debriefing by ensuring that they cover all teaching points, tasks, and ask questions during the debriefings. Each session debriefing has an overall goal (for example: role acquisition) and is subsequently divided into sections with central foci for each section. Instructors must check off each task and question acknowledging that they have been covered. The instructor cannot move on to the next section without having completed everything on the checklists. The web pages are designed in a way that they can be modified to be used with other courses taught at WISER

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1561 - POSTER BOARD # 63

Learning with the Human Patient Simulator: Is it Necessary to be in the "Hot Seat"? A Pilot Study

Sabrina Khoo,[1] Gee-Mei Tan,[2] Lian K Ti,[1,2] Fun-Gee Chen[1,2]; [1]Yong Loo Lin School of Medicine, National University of Singapore, [2]National University Hospital, Singapore

BACKGROUND: The Human Patient Simulator (HPS) confers the benefit of hands-on learning in addition to visual learning and active reinforcement inherent in small-group teaching. For this benefit, putting each student into the "hot-seat", i.e. to manage a scenario, has become the norm in HPS teaching. However, a recent study by Morgan et al questioned the merit of this exercise, as they found no advantage in using the HPS compared to tutor-facilitated video reviews for the teaching of medical students. We hypothesize that students gain the hands-on learning benefit only when they are in the hot-seat. In Morgan's study, students had hands-on for only a portion of each scenario, and were observers for the rest of the scenario, deriving no additional benefit compared to the video group. Therefore, we carried out a pilot study to investigate if students need to be in the hot-seat to fully benefit from HPS-based teaching.

METHOD: 4th year medical students posted to anaesthesia were recruited and divided into groups of 4–6 students. Students were orientated to the manikin, monitors, drugs, and all equipment necessary for successful completion of the scenarios. Each student in turn was assigned a different scenario to manage, while the rest of the group watched via video-link. The scenarios were anaphylaxis, myocardial infarction, pulmonary embolism, tension pneumothorax, hypovolemic shock, and severe bronchospasm. Five learning objectives were emphasized, namely (1) crisis recognition; (2) basic management; (3) differential diagnosis; (4) specific management; and (5) correct drugs. A group debriefing was done at the end, facilitated by a tutor using videotaped recordings of the scenarios, paused at appropriate junctures to emphasize learning points, facilitate discussion, and answer questions. After a break, one of the scenarios taught earlier was randomly chosen as the test scenario. Each student was given 10 minutes to manage the scenario. The student who had managed the test scenario previously during the teaching session was considered to be in the hot-seat group, with the others as control. Marking was performed off-line by two blinded assessors, using mean scores as the final score.

RESULTS: 54 students participated in this study in 10 different groups, resulting in 10 students in the hot-seat group and 44 students in the control group. The students in the hot-seat group had better scores (72%±20% vs. 64%±17%; p=0.257). When their scores were ranked within individual groups, students in the hot-seat group had the highest score 40% of the time, and were ranked within the top two 70% of the time. This compares with the control group, who were ranked within the top two only 36% of the time (p=0.078). The hot-seat group had a median rank of 1 compared to a median rank of 4 in the control group. Inter-rater agreement was good (correlation = 0.824).

CONCLUSION: This study suggests that students in the hot-seat learn better than those observing, although the sample size was too small to be statistically significant. A bigger study is being carried out to confirm these findings.

REFERENCE:

Morgan et al. Anesthesiology 2002

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

ABSTRACT # 1562 - POSTER BOARD # 70

Do Medical Students Learn and Retain the Skill of Endotracheal Intubation Better with Directed or Experiential Learning?

Lian K Ti,[1,2] Gee-Mei Tan,[2] Sabrina Khoo,[1] Fun-Gee Chen[1,2]; [1]Yong Loo Lin School of Medicine, National University of Singapore, [2]National University Hospital, Singapore

BACKGROUND: Endotracheal intubation is an important clinical skill that is difficult to learn and retain. The goal of this study is to improve the learning and retention of the taught skill of endotracheal intubation by medical students. We hypothesize that students will learn and remember how to perform this skill better when they are forced to experience the difficulties of self-directed (experiential) learning, compared to when they are guided from the start (the existing learning method).

MATERIALS AND METHODS: All fourth-year medical students posted to anesthesia were recruited and randomly assigned to one of two groups, to experience either directed or experiential learning. All students were initially taught a standard method of intubation using a video recording. Students in the directed group were then individually brought through intubation using the traditional step-by-step instruction technique by an experienced anesthesiologist on a manikin head. Students in the experiential group were left on their own to "sink-or-swim", in which the anesthesiologist took a back seat and allowed the student to figure out the correct technique of intubation; students were rescued after 10 minutes. Both groups had multiple opportunities to intubate the manikin head. The students were recalled 3 months later. Each student was individually tested on their intubation skill using a manikin head. Students were assessed on 4 major categories, namely (1) preparation of equipment; (2) correct intubation technique; (3) successful intubation and confirmation of placement, and (4) continued ventilation in between attempts. Their attempts were videotaped and analyzed off-line by two blinded investigators.

RESULTS: 36 students participated in the study, 17 in the directed group and 19 in the experiential group. 78% of the students in the experiential group successfully intubated the manikin, compared to 41% in the directed group ($p=0.039$). The experiential group also had higher overall scores (82% ± 10% vs. 72% ± 14%; $p=0.038$). The major difference between the groups was that the students in the experiential group were more likely to successfully intubate and correctly confirm placement of the tube. The inter-rater correlation was good (0.853).

CONCLUSION: Students were able to learn and retain the skill of endotracheal intubation significantly better with the experiential method of learning. This study suggests that adult or experiential learning should be adopted for the teaching of critical clinical skills such as endotracheal intubation.

CONFLICT OF INTEREST: Authors indicated they have nothing to disclose.

Abstract publication made possible in part under contract W81XWH-06-0282, Telemedicine and Advanced Technology Research Center.

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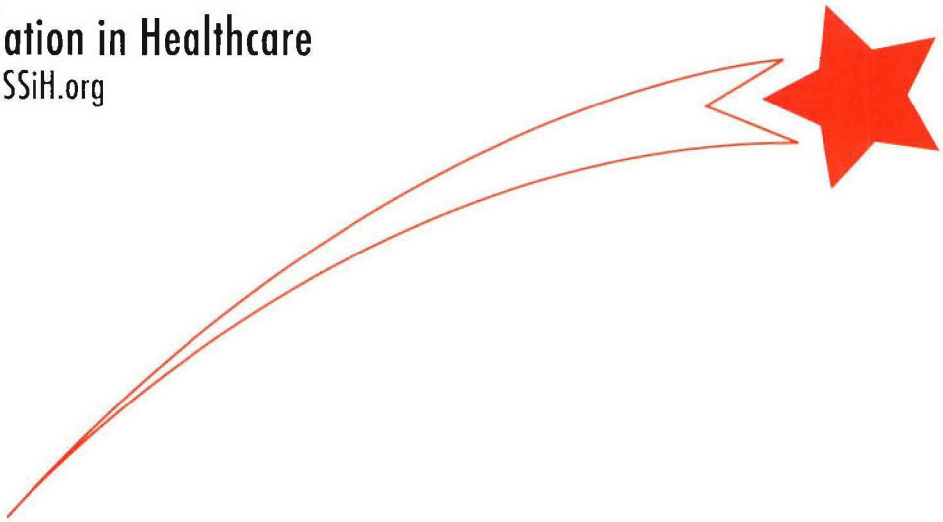

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Call for Workshop Proposal Submissions

Workshop Description:

- A 45- (or 90-) minute workshop session allows participants to acquire and practice skills or to work together on common problems.
- Strategies to encourage participants' active involvement in the session should be explicitly described.
- Workshops are not lectures, but rather presentations that include audience participation structured into the activity as discussion, hands-on demonstration, evaluation, etc.

Examples of appropriate workshop topics might be:

- Demonstration and application of a type of curriculum
- Demonstration and practice of a new teaching technique
- Demonstration and use of new hardware or software technology
- Interactive session to develop new perspectives

Proposal Review Criteria:

- Timeliness and potential for interest
- Clarity of proposal (description, objectives, strategies for participant involvement)
- Appropriateness of proposal for the workshop format (session plan, content, the proposed participant and presenter roles)
- Experience/expertise of presenters

Proposal Submission Format: (Limit 800 words)

- Title
- Description of workshop topic and rationale for importance
- Learning objectives
- Session plan (session activities, activities sequence, time allotments for each activity)
- Presenters (name, institution, relevant experience)

Additional information required for submission

- Abstract (75 words, not included in 800-word proposal limit)
- 45 min or 90 min slot requested
- Appropriate size of audience i.e. <50, 50-150, >150
- Identify if work of a group i.e. SSH, AAMC, etc.
- COI statement (with submission) and copy of CV for lead presenter following acceptance. All faculty participants must indicate that they do or do not have a financial interest/arrangement or direct affiliation with a corporate organization that has a direct interest in the subject matter of the workshop (including manufacturer(s) of any product or provider(s) of any services.)
- Type, model mannequin to be used if required for workshop.

Presentation Information

- Accepted workshops are responsible for obtaining their own required resources.
- Each workshop room will have screen, LCD, wireless mike and flip chart.
- Workshops will be scheduled Monday and Tuesday, January 15 & 16, 2007
- Each lead presenter will be assigned a Workshop Committee advisor

Deadlines

- Submission: September 1, 2006
- Notification: October 1, 2006

Rules of registration:

- All faculty participants must officially register and pay appropriate registration fee
- $500/$250 (90 min/45 min) provided to the lead presenter for distribution

Workshop Chairs:

S. Barry Issenberg, MD (barryi@miami.edu)
Marcus Rall, MD (marcus.rall@med.uni-tuebingen.de)

7th International Meeting on Simulation in Healthcare

Leading to Safer Healthcare

January 14-17, 2007 – Orlando, FL

Call for Abstracts

General Information: The Abstract Committee for the 2007 IMSH is accepting two types of abstracts:

Research Abstracts: These represent original research that has not been published in a national journal and which presents innovative projects, curriculum and technology programs and development. Abstracts presented at a regional or international meeting are accepted. Simulation research using standardized patients and virtual reality as well as mannequin simulators, task trainers and computer-based simulations are encouraged. These abstracts are peer-reviewed and those accepted will be published in the Journal and presented poster-side by the author(s) during Professor Rounds.

Work in Progress - Abstracts: These offer an opportunity for authors to present early work for comments and discussion with attendees while they are posted. Abstracts may also represent how-to or we-did projects. These abstracts are NOT peer-reviewed and will not be published in the Journal but will be electronically published on the Society's website. The Abstract Committee will select up to*125* abstracts submitted in this category.

Presentation Formats: Abstracts may be presented either by poster board only, Poster board and demonstration (requiring a table and electricity) or demonstration only (requiring only a table and electricity and NO board). Poster boards are 8'w x 4'h and accept Velcro or tacks.

Conflict of interest: All presenting authors must indicate that they do or do not have a financial interest/arrangement or direct affiliation with a corporate organization that has a direct interest in the subject matter of the abstract (including manufacturer(s) of any product or provider(s) of any services.)

Ethics Consideration: All abstracts must indicate that their research was reviewed by their local Institutional Review Board or that IRB review was not applicable.

Poster Viewing:

- Non-Peer-Reviewed – Monday 1/15/07 7am–4 pm
- Peer-Reviewed Research – Monday 1/15 6-8 pm and Tuesday 1/16/07 7am-4pm

Oral Presentations of Research Abstracts: Selected abstract authors will be notified by October 10 of an invitation by the Abstract Committee to orally discuss their abstract (10 minute presentation and Q&A) on Tuesday morning, January 16, followed by Professor Rounds at which all Research Abstract authors are required to be in attendance to discuss their posters.

Journal Publication of Research Abstracts: Accepted research abstracts are published in the Society for Simulation in Healthcare's Journal (unless the author notes otherwise on the submission form.)

Syllabus Publication: All accepted abstracts (research and Work in Progress) will be included in course syllabus.

Research Awards: Up to three awards (1st, 2nd, 3rd; 250/$100/$50 and certificate) in each category of Research Abstracts will be selected by the Abstract Committee. An overall best research abstract award ($500 and certificate) and best trainee research abstract award ($100 and certificate) also will be selected.

Review Process: The Abstract Committee is responsible for reviewing all submissions. Accepted peer-reviewed abstracts are those judged scientifically valid and which yield important information which will benefit patient care and which demonstrate the value of use of simulation in health care education, credentialing, research, patient safety, and simulation center design and operations.

Conference Registration: The presenting author must pay full applicable registration fee unless designated as official conference faculty. Exhibitor representatives must pay full applicable registration fee if presenting an abstract.

Abstract Submission Requirements:

Both types of abstracts must meet the submission criteria detailed below.

1. The three categories of abstracts are: Education, Patient Safety, and Technology & Center Operations. Examples of each are:

Education
- Curriculum Description
- Curriculum Software
- Curriculum Studies

Patient Safety Products/Projects
- Certification
- Event Reconstruction
- Process Improvement

Technology and Center Operations
- New Hardware
- New Software
- Simulation Center design and operations

2. All abstracts will be submitted online after 6/1/06 and before the deadlines listed below. NO abstracts will be accepted by fax or direct e-mail.

3. Abstracts are limited to one page (500 words or 350 words with graphs or tables or photographs.)

Deadlines:

Research Abstracts –
Submission - September 15
Notification – October 1

Work in Progress Abstracts -
Submission - October 22
Notification – November 7

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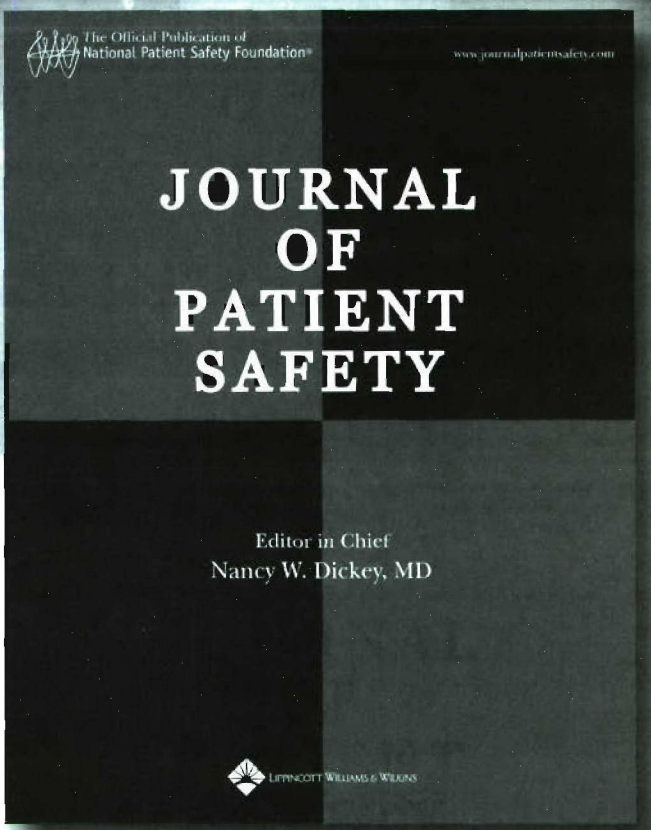

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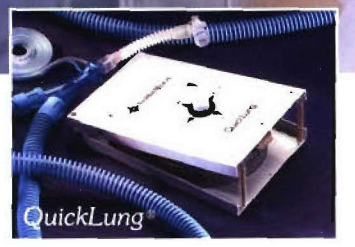

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